SOIL SURVEY

Columbia County Pennsylvania

OUR SOIL ★ OUR STRENGTH

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
THE PENNSYLVANIA STATE UNIVERSITY
College of Agriculture and Agricultural Experiment Station
and the
PENNSYLVANIA DEPARTMENT OF AGRICULTURE
State Soil and Water Conservation Commission
Issued March 1967

Major fieldwork for this soil survey was done in the period 1950–61. Soil names and descriptions were approved in 1965. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1965. This survey was made cooperatively by the Soil Conservation Service and the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture, State Soil and Water Conservation Commission. It is part of the technical assistance furnished to the Columbia County Soil Conservation District.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY of Columbia County contains information that can be applied in managing farms and woodlands; in selecting sites for roads, ponds, buildings, or other structures; and in appraising the value of tracts of land for agriculture, industry, or recreation.

Locating Soils

All the soils of Columbia County are shown on the detailed map at the back of this report. This map consists of many sheets that are made from aerial photographs. Each sheet is numbered to correspond with numbers shown on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbols. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information in the report. This guide lists all of the soils of the county in alphabetic order by map symbol. It shows the page where each kind of soil is described, and also the page for the capability unit and building site group in which the soil has been placed.

Individual colored maps showing the relative suitability or limitations of soils for many specific purposes can be developed by using the soil map and information in the text. Interpretations not included in the text can be developed by grouping the soils according to their suitability or limitations for a particular use. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils in the soil descriptions and in the discussions of the interpretative groupings.

Foresters and others can refer to the subsection "Woodland Management," where the soils of the county are grouped according to their suitability for trees.

Game managers, sportsmen, and others concerned with wildlife will find information about soils and wildlife in the subsection "Use of Soils for Wildlife."

Community planners and others concerned with community development can read about the soil properties that affect the choice of homesites, industrial sites, schools, and parks in the subsection "Use of Soils in Community Development."

Engineers and builders will find under "Engineering Applications" tables that give engineering descriptions of the soils in the county and that name soil features affecting engineering practices and structures.

Scientists and others can read about how the soils were formed and how they are classified in the section "Formation and Classification of Soils."

Students, teachers, and others will find information about soils and their management in various parts of the text.

Newcomers in Columbia County may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the section "Additional Facts About the County."

U.S. GOVERNMENT PRINTING OFFICE: 1967

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Washington, D.C. 20402

Contents

NOTICE TO LIBRARIANS

Series year and series number are no longer shown on soil surveys. See explanation on the next page.

Issued March 1967

EXPLANATION

Series Year and Series Number

Series year and number were dropped from all soil surveys sent to the printer after December 31, 1965. Many surveys, however, were then at such advanced stage of printing that it was not feasible to remove series year and number. Consequently, the last issues bearing series year and number will be as follows:

- Series 1957, No. 23, Las Vegas and Eldorado Valleys Area, Nev.
- Series 1958, No. 34, Grand Traverse County, Mich.
- Series 1959, No. 42, Judith Basin Area, Mont.
- Series 1960, No. 31, Elbert County, Colo. (Eastern Part)
- Series 1961, No. 42, Camden County, N.J.
- Series 1962, No. 13, Chicot County, Ark.
- Series 1963, No. 1, Tippah County, Miss.

Series numbers will be consecutive in each series year, up to and including the numbers shown in the foregoing list. The soil survey for Tippah County, Miss., will be the last to have a series year and series number.

SOIL SURVEY OF COLUMBIA COUNTY, PENNSYLVANIA

REPORT BY PAUL H. PARRISH, SOIL CONSERVATION SERVICE

SOILS SURVEYED BY PAUL H. PARRISH, WARWICK M. TINSLEY, ROBERT P. ZIMMERMAN, ROBERT K. CRAVER, ROBERT CRUIKSHANK, AND W. R. BYRNE, SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE PENNSYLVANIA STATE UNIVERSITY, COLLEGE OF AGRICULTURE AND AGRICULTURAL EXPERIMENT STATION, AND THE PENNSYLVANIA DEPARTMENT OF AGRICULTURE, STATE SOIL AND WATER CONSERVATION COMMISSION

COLUMBIA COUNTY, in the east-central part of Pennsylvania (fig. 1), has a land area of 484 square miles, or 309,760 acres. Bloomsburg, the county seat, is on the North Branch of the Susquehanna River.

About 36 percent of the county is cropland, and about 45 percent is woodland. Approximately one-third of the woodland is on farms. Only about 8 percent of the county is in pasture. General farming and dairy farming are the main kinds of agriculture in the county. On a few farms, truck crops and fruit orchards provide the major source of income.

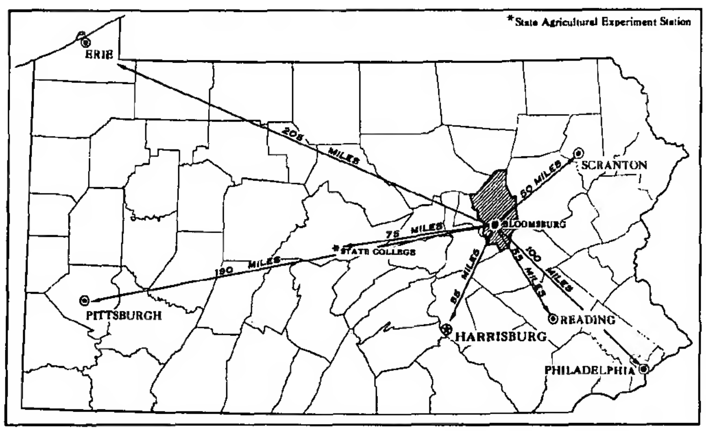

Figure 1.—**Location of Columbia County in Pennsylvania.**

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soils are in Columbia County, where they are located, and how they can be used.

They went into the county knowing they likely would find many soils they had already seen, and perhaps some they had not. As they traveled over the county, they observed steepness, length, and shape of slopes; size and speed of streams; kinds of native plants or crops; kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by roots of plants.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. To use this report efficiently, it is necessary to know the kinds of groupings most used in a local soil classification.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Chenango and Middlebury, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that go with their behavior in the natural, untouched landscape. Soils of one series can differ somewhat in texture of the surface soils and in slope, stoniness, or some other characteristic that affects use of the soils by man.

Many soil series contain soils that differ in texture of their surface layer. According to such differences in texture, separations called soil types are made. Within a series, all the soils having a surface layer of the same texture belong to one soil type. Chenango gravelly sandy loam and Chenango silt loam are two soil types in the Chenango series. The difference in texture of their surface layers is apparent from their names.

Some types vary so much in slope, degree of erosion, number and size of stones, or some other feature affecting their use, that practical suggestions about their management could not be made if they were shown on the soil map as one unit. Such soil types are divided into phases. The name of a soil phase indicates a feature that affects management. For example, Chenango gravelly sandy loam, 3 to 12 percent slopes, moderately eroded, is one of several phases of Chenango gravelly sandy loam, a soil type that ranges from nearly level to steep.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodland, buildings, field borders, trees, and other details that greatly help in drawing boundaries accurately. The soil map in the back of this report was prepared from the aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning management of farms and fields, a mapping unit is nearly equivalent to a soil type or a phase of a soil type. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil type or soil phase.

In some places two or more similar soils are mapped as a single unit, called an undifferentiated soil group, if the differences between the two soils are too small to justify separate mapping. An example in this county is Lawrenceville and Duncannon silt loams, 3 to 8 percent slopes. Also, on most soil maps, areas are shown that are so rocky, so shallow, or so frequently worked by wind and water that they scarcely can be called soils. These areas are shown on a soil map like other mapping units, but they are given descriptive names, such as Riverwash or Steep very stony land, and are called land types rather than soils.

While a soil survey is in progress, samples of soils are taken, as needed, for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soils in other places are assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soils. Yields under defined management are estimated for all the soils.

But only part of a soil survey is done when the soils have been named, described, and delineated on the map, and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in a way that it is readily useful to different groups of readers, among them farmers, managers of woodland, engineers, and homeowners. Grouping soils that are similar in suitability for each specified use is the method of organization commonly used in the soil surveys. On the basis of the yield and practice tables and other data, the soil scientists set up trial groups, and test these by further study and by consultation with farmers, agronomists, engineers, and others. The scientists then adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

General Soil Map

The general soil map at the back of this report shows, in color, the soil associations in Columbia County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location or large tracts that are suitable for a certain kind of farming or other land use. Such a map is *not* suitable for planning the management of a farm or field, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect management.

Soil associations 1, 2, and 3 are in the northern part of the county and consist mainly of reddish soils that range from nearly level to steep. In soil association 4 the soils are on level and nearly level terraces and flood plains, and in associations 5 and 6 the soils are rolling and grayish. Brownish soils on undulating and rolling hills make up soil association 7. Soil association 8 consists of gently sloping, silty soils in the valleys of the central part of the county. Red soils on rolling shale hills make up soil association 9, and steep to gently sloping, stony soils on mountains and ridges make up association 10. Soil association 11 is at the foot of mountains, and in association 12 the soils have been disturbed by mining or other activity.

1. Lordstown-Oquaga association: *Steep, gray and red stony soils of the ridges and valley walls in the extreme northern part of the county*

This association is made up of stony ridges and valley walls where streams have cut into the Allegheny Plateau and have exposed layers of red and gray rocks. The association is dominantly wooded and has been cleared in only a few areas. It is in the extreme northern part of the county.

The Lordstown soils occupy about 50 percent of this association. They are shallow, medium-textured, gray soils that contain many coarse fragments and are interspersed with outcrops of rock. The Oquaga soils, which cover about 35 percent of the association, have rock ledges and are similar to the Lordstown soils but are red instead of gray. For farming and for nonfarm uses, both Lordstown and Oquaga soils are limited by droughtiness, steep slopes, and many outcrops of shale and sandstone. Practices for conserving soil and water are needed in most areas.

Among the remaining 15 percent of this association are soils of the flood plains; steep, very stony soils; the moderately well drained Wellsboro soils; and the poorly drained Morris soils.

Because this association has a low potential for producing timber, intensive management of woodland is not economically feasible. It is most valuable as wildlife areas. Hunting and hiking are the main recreational uses. Practicing good conservation helps to maintain an even flow in the streams at the base of slopes and helps to keep the water clean for fish and for municipal use.

2. Wellsboro-Morris-Oquaga association: *Gently sloping and nearly level soils in reddish till in the northern and central parts of the county*

This association is made up of gently sloping and nearly level areas that are very stony and wooded in

many places. It is in the east-central part of the county and is just below the Allegheny Mountains in the northern part. Fairly large areas have been cleared, cultivated, and abandoned.

Wellsboro soils occupy about 30 percent of this association. These soils are gently sloping and have good surface drainage. They are moderately well drained, are medium textured, and have a fragipan. The Morris soils also occupy about 30 percent of the association. They are nearly level and have slow surface drainage. Morris soils are poorly drained, are medium textured to moderately coarse textured, and have a fragipan near the surface. Oquaga soils amount to about 15 percent of the association. These soils are medium textured and contain many coarse fragments. They are limited in their use for farming by many rock ledges.

Other soils account for about 25 percent of the association. Some of these soils are on flood plains, and some are in depressions and are wet.

In this association, only the Wellsboro soils have a good potential for farming, but most of the rest of the association can be used as grassland. Much of the association is wooded and can produce good timber. Only the Oquaga soils provide good foundations without requiring sealing and draining. Generally, disposal of effluent from septic tanks is not feasible on this association. Under good management, recreational areas and wildlife habitat can be provided.

3. Oquaga-Wellsboro-Morris association: Nearly level to steep soils in reddish till on low ridges and the sides of valleys in the northern part of the county

The low ridges and valley walls that dominate in this association range from steep and well drained to nearly level and poorly drained. The association is in the northern part of the county. It is made up of about equal amounts of cropland and woodland, but some farms have been abandoned and are now used as hunting camps.

The Oquaga soils occupy about 25 percent of this association. These soils are shallow, well drained, and medium textured and moderately coarse textured. Steepness and stoniness limit their use for farming. The moderately well drained Wellsboro soils, which occupy about 20 percent of the association, are on gentle to moderate slopes of ridgetops and valleys. These soils have a fragipan that impedes the movement of air and water. The poorly drained Morris soils also occupy about 20 percent of this association. They are level and nearly level and have slow surface runoff.

Among the soils that make up the remaining 35 percent of the association are soils on the flood plains and small areas of very poorly drained Lickdale soils.

Some of this association is suitable for farming, but much of it is not. The association can produce good timber if woodland management is good. Also, it would make a good recreational area. Only a few places are suitable for disposing of effluent from septic tanks.

4. Chenango-Barbour-Pekin association: Nearly level and level soils on terraces and flood plains

The alluvial terraces and flood plains that make up this soil association are well drained and moderately well drained. Most of the association has been cleared and is used for crops and pasture. Some areas have been developed for industrial uses.

The Chenango soils occupy about 40 percent of this soil association. These soils are on terraces and are deep, well drained, and gravelly. They are suitable for farming, but they tend to be droughty. Chenango soils are easily worked, and on them crops respond well to additions of fertilizer and lime. Although areas above flood level are good sites for most kinds of community development, Chenango soils do not provide adequate filtration for disposal of effluent from septic tanks.

Barbour soils occupy about 25 percent of the association. These soils are deep, well drained, and loamy. They developed in silty and sandy material and are underlain by sand and gravel. Barbour soils are fairly good for farming but are subject to flooding in some places.

Pekin soils occupy about 15 percent of the association. These moderately well drained soils are on terraces above the flood plains. In this county Pekin soils are loamy and cobbly. Their use for farming and community development is limited by a seasonally high water table.

Among the soils in the remaining 20 percent of this association are the moderately well drained Braceville and Basher soils, the poorly drained Holly soils, and the very poorly drained Papakating soils.

This soil association has good potential for farming. Good timber could be produced, but little of the acreage is now woodland. Much of the association is poorly suited to disposal of effluent from septic tanks. In some areas community development is severely limited by the likelihood of flooding.

5. Wooster-Ravenna-Lordstown association: Rolling, grayish soils in glacial till in the northeastern part of the county

The rolling areas that make up this soil association are poorly drained to well drained. The association is in a single tract in the northeastern part of the county. Most of it has been cleared and is farmed, but steep areas and poorly drained areas are generally in trees.

The Wooster soils occupy about 35 percent of the association. These deep, well-drained, brownish soils developed in gravelly deposits. They are acid and are permeable to air and water. Crops on these soils respond well to additions of lime and fertilizer. Except in steep areas, Wooster soils are suitable for farming. Most areas provide suitable sites for the foundations of buildings and have few limitations for the disposal of effluent from septic tanks. The Ravenna soils occupy about 35 percent of the association. These soils are nearly level, somewhat poorly drained, and medium textured. For most uses, they are severely limited by the seasonally high water table. The Lordstown soils make up about 20 percent of the association. These steep soils are shallow and moderately deep. They are loamy, but also channery, and they have many rock ledges. Also, they tend to be droughty. These characteristics limit their use for farming and for community development.

Among the soils that make up the remaining 10 percent of the association are the moderately well drained, gently sloping Canfield soils and soils on the flood plains.

This association is moderately well suited as farmland and is well suited as woodland. The mixed pattern of land use makes the association a good area for wildlife. Much of the association is unsuitable for disposal of effluent from septic tanks, because the water table is seasonally high and bedrock is near the surface.

6. Weikert-Hartleton association: Grayish soils in gently rolling to hilly areas underlain by shale, mostly in the central part of the county

The gently rolling to hilly areas that make up this soil association are in the north-central, central, and southwestern parts of the county. The association is generally well drained, but drainage ranges from good to poor. About half of the association is cropland, and the rest is woodland or small developed areas.

Weikert soils occupy about 25 percent of the association. These well-drained, shallow shaly soils are droughty. Because they are also generally steep, their potential for agricultural or community development is limited. The Hartleton soils occupy about 25 percent of the association. They are moderately deep, well-drained soils that are underlain by gray shale and sandstone. Hartleton soils have moderate to high moisture-holding capacity and are generally more suitable for farming than the Weikert soils.

Among the soils that make up the remaining 50 percent of the association are the moderately well drained Watson soils, the somewhat poorly drained Shelmadine soils, and the well drained Allenwood soils.

Generally, the well-drained soils in this association are suitable for farming and forestry. Conservation practices conserve soil and water and encourage an increase in wildlife. The deep, well-drained soils are suitable for community development where slopes are favorable.

7. Berks-Watson association: Brownish soils on undulating and rolling hills in the northwestern part of the county

The undulating and rolling hills that make up this association are in a single area in the northwestern part of the county. The association is generally well drained or moderately well drained. Most of the acreage is used for general farming and dairy farming.

The Berks soils occupy about 40 percent of the association. These soils are moderately deep, well drained, and generally shaly. They tend to be droughty, but crops on them respond well to additions of lime and fertilizer. Because shale is near the surface, the Berks soils are generally not suitable for disposing of effluent from septic tanks. Watson soils occupy about 30 percent of the association. These soils are gently sloping, deep, and well drained. Between a depth of 20 and 36 inches, a firm fragipan slows the movement of air and water. Watson soils are limited in their use for farming and for community development.

Among the soils that make up the remaining 30 percent of the association are the shallow, well-drained Weikert soils and the poorly drained Shelmadine soils in depressions and along drainageways.

The soils in this association have fair potential for farming, particularly grassland farming. Much good timber could be produced, though little of the acreage is now wooded. The well-drained soils provide good sites for the foundations for houses, but bedrock is generally too near the surface to permit the disposal of effluent from septic tanks. Wildlife habitat can be improved by planting shrubs, but there are few places suitable for impoundment of water.

8. Westmoreland-Litz association: Gently sloping, silty, loamy soils over calcareous rocks in valleys in the central part of the county

The gently sloping areas that make up this association are mainly in the central part of the county. Most of the association is used for general farming and dairy farming, but some areas are in community development.

The Westmoreland soils occupy about 40 percent of the association. These soils are medium textured, naturally fertile, and high in moisture-holding capacity. They produce good yields of most crops grown in the county. The Litz soils occupy about 40 percent of the county. They are shallow and moderately deep, well-drained soils over yellowish, calcareous, soft shale. Litz soils are easily managed but tend to be droughtly because they are shallow to bedrock.

Among the soils that occupy the remaining 20 percent of the association are the moderately well drained Wiltshire soils, the deep, well drained Washington soils, and the deep, well drained Belmont soils.

The most fertile soils in the county are in this association. They are well suited to general crops and to trees. Although trees grow well, new plantations are probably not economically feasible. Some areas between Bloomsburg and Berwick are in community development. Because bedrock is near the surface, Litz soils are of limited use for community development.

9. Klinesville-Leck Kill association: Red soils on the rolling shale hills in the central and southern parts of the county

The rolling shale hills that make up this soil association are mostly farmed, but some small, steep, very stony areas are wooded. The association is in several areas in the central and southern parts of the county.

The very shallow Klinesville soils occupy about 35 percent of this association. These soils have low natural fertility. They are droughty, for their moisture-holding capacity is low. They are not well suited as cropland or woodland. Klinesville soils provide good sites for foundations of buildings, but the bedrock near the surface severely limits use as disposal fields for effluent from septic tanks. The moderately deep, well-drained Leck Kill soils make up about 30 percent of the association. These soils are not so desirable for farming or for community development as deeper soils, but they are better suited than wet soils.

Among the soils that make up the remaining 35 percent of the association are the moderately well drained Albrights soils, the poorly drained Shelmadine soils, and soils on flood plains.

Although this association is used mostly for farming, careful management is needed if crop yields are to be favorable. The potential for timber production is good. Most areas make good foundations for housing. Except on the steep slopes, the deep Leck Kill soils are suitable

for disposing of effluent from septic tanks. Good areas for recreation could be developed in this soil association.

10. Dekalb-Edgemont association: Steep to gently sloping, yellowish stony soils on the mountains and ridges in the central and southern parts of the county

Most of the forested, mountainous areas of the county are in this soil association. Some of these areas have been burned over and are in scrub pine, pitch pine, and blueberries. Few areas are cultivated. The association is in the southern and central parts of the county.

The moderately deep, well-drained Dekalb soils occupy about 60 percent of the association. These soils have low natural fertility. They are low in moisture-holding capacity and are somewhat droughty. Use is limited by the steep slopes and the bedrock near the surface. The Edgemont soils, which occupy about 30 percent of the association, are deep, well drained, and medium textured. They have low natural fertility and moderate and low moisture-holding capacity.

The remaining 10 percent of this association consists of small areas of soils on flood plains, a few areas of moderately well drained and poorly drained soils, and some steep, very stony land.

This association generally is not suitable for farming, but good timber can be grown, except on the ridges where the soil is shallow. Most areas are too steep for housing development, though in many places sites for foundations are good. Some of the soils are suitable for disposing of effluent from septic tanks. Recreation, particularly hunting and hiking, is one of the best uses for this association. Good management is needed to keep the streams clear for municipal, industrial, and recreational uses.

11. Laidig-Buchanan association: Moderately sloping, deep soils on colluvium at the foot of the mountains in the southern part of the county

This soil association on moderate slopes is mostly wooded, but some of it is pasture. It is mostly in the southern part of the county.

The deep, well-drained Laidig soils occupy about 40 percent of the association. These soils have moderate natural fertility and moderate and high moisture-holding capacity. Farming on Laidig soils is limited mainly by stoniness. The moderately well drained Buchanan soils occupy about 40 percent of the association. These soils are on the lower slopes where runoff is slow. In the Buchanan soils a fragipan slows the movement of air and water and the development of plant roots. A seasonally high water table limits use for farming and for community development, but good timber can be produced. Other soils occupy the remaining 20 percent of the association.

This association is only moderately well suited to farming, but it is well suited to forestry. In the moderately well drained Buchanan soils, the disposal of effluent from septic tanks is limited by the impervious layer in the subsoil and by a seasonally high water table. Because much of the association consists of woodland adjacent to cropland, habitat for many kinds of wildlife is excellent. Some of the small, poorly drained areas may be suitable for development of wildlife marshes.

12. Strip mines-Made land association: Gently sloping to steep areas where the soil has been disturbed by surface mining or other activity

This association consists mainly of strip mines around which there are sheer walls and steep piles of spoil. Large open pits are separated by piles of rubble that contain varying amounts of finer particles. The association is extremely acid and almost bare, but small areas have been leveled and planted to trees.

This association is not suitable for farming, but trees can be grown and habitat for wildlife improved if the excavations are backfilled and leveled. After vegetation is established, some areas can be made into parks or campsites. Probably, some of the open pits are suitable sites for ponds. The characteristics of the soils in this association vary so much from place to place that use for housing or for septic tanks cannot be evaluated.

Use and Management of the Soils

The soils of Columbia County are used for crops, trees, and pasture. This section explains how the soils can be used for these purposes, and it gives productivity ratings for crops commonly grown in the county. Also discussed are providing wildlife habitat, building highways, farm ponds, and other engineering structures, and developing community areas. In presenting information about the use of soils for crops and pasture, as woodland, and for building sites, the procedure is to describe groups that are made up of soils suitable for those purposes and to suggest use and management for those groups.

Capability Groups of Soils

The capability classification is the grouping of soils to show, in a general way, their suitability for most kinds of farming. It is a practical classification based on limitations of the soils, the risk of damage when they are used, and the way they respond to treatment. The soils are classified according to degree and kind of permanent limitation, but without consideration of major and generally expensive landforming that would change the slope, depth, or other characteristics of the soils; and without consideration of possible but unlikely major reclamation projects.

In this capability system, all kinds of soils are grouped at three levels, the capability class, subclass, and unit. These are discussed in the following paragraphs.

Capability Classes, the broadest grouping, are designated by Roman numerals I through VIII. As the numerals increase, they indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I. Soils that have few limitations that restrict their use.

Class II. Soils that have some limitations that reduce the choice of plants, or require moderate conservation practices.

Class III. Soils that have severe limitations that reduce the choice of plants, require special conservation practices, or both.

Class IV. Soils that have very severe limitations that restrict the choice of plants, require very careful management, or both.

Class V. Soils that are subject to little or no erosion but that have other limitations, impractical to remove, that limit their use largely to pasture, woodland, or wildlife food and cover. There are no soils in class V in Columbia County.

Class VI. Soils that have severe limitations that make them generally unsuited to cultivation and that limit their use largely to pasture, woodland, or wildlife food and cover.

Class VII. Soils that have very severe limitations that make them unsuited to cultivation and that restrict their use largely to grazing, woodland, or wildlife.

Class VIII. Soils and landforms that have limitations that preclude their use for commercial plant production and that restrict their use to recreation, wildlife, or water supply, or to esthetic purposes.

CAPABILITY SUBCLASSES are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States but not in this county, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only subclasses indicated by *w*, *s*, and *c*, because the soils in it are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, range, woodland, wildlife, or recreation.

CAPABILITY UNITS are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-4 or IIIe-3. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation, and the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph. The Arabic numeral specifically identifies the capability unit within each subclass.

Management by capability units

In this subsection each capability unit in Columbia County is described, and use and management are discussed. Fertilizer and lime should be added in amounts indicated by soil tests. The names of soil series represented are mentioned in the description of each capability unit, but this does not mean that all the soils of a given series appear in the unit. To find the names of all the soils in any given capability unit, refer to the "Guide to Mapping Units" at the back of the report.

CAPABILITY UNIT I-1

This unit consists of deep, well-drained, nearly level Allenwood, Chenango, Leck Kill, and Washington soils. These medium-textured, friable soils formed in glacial drift on uplands and terraces. The moisture-holding capacity is high, and crops respond well to fertilizer and lime. The Chenango soils are more permeable than the other soils in the unit and have slightly less moisture-holding capacity. The Leck Kill soils are channery.

The soils in this unit are well suited to all crops commonly grown in the county. Row crops can be grown continuously if erosion is controlled by contour farming on long slopes, if cover crops are used or the residue from row crops is returned to the soils, and if fertilizer and lime are added.

CAPABILITY UNIT I-2

This unit is made up of deep, well-drained Barbour and Tioga soils. These medium-textured and moderately coarse textured, nearly level soils occur in alluvium on flood plains. They are friable and easily worked. The moisture-holding capacity is moderate to high, and crop response to fertilization is good. Floods occasionally cover these soils and leave fresh sediment, but flooding is rare during cropping season. Some areas have not been flooded in 30 years.

The soils in this unit are well suited to all crops commonly grown in the county. Irrigation may be desirable where crops of high value are grown. In fields where row crops are grown continuously, the supply of organic matter and good soil structure can be maintained if fertilizer and lime are added and if cover crops are seeded or the residue from row crops is returned to the soil.

CAPABILITY UNIT IIe-1

This unit consists of deep, well-drained Allenwood, Belmont, Lackawanna, Leck Kill, Washington, Westmoreland, and Wooster soils. Most of these medium-textured, gently sloping soils occur in glacial till in moderately eroded areas of the uplands. Some of these soils are channery.

The soils in this unit are well suited to all crops commonly grown in the county. Erosion can be controlled if the cropping system is not more intensive than 2 years of row crops, 1 year of a small grain, and 1 year of hay, if fertilizer and lime are added, and if other suitable practices are used. These practices include contour stripcropping, diversion terraces, and the use of cover crops or the return of the residue from row crops to the soils.

CAPABILITY UNIT IIe-2

This unit consists of deep, well-drained, moderately eroded Chenango and Laidig soils. These medium-textured and coarse-textured soils occur on gently sloping terraces and colluvium. They formed in material that had been thoroughly mixed. They are permeable and have moderately high moisture-holding capacity, but a pan several feet from the surface may restrict the movement of water in the Laidig soil.

The soils in this unit are well suited to all crops commonly grown in the county. Irrigation may be desirable where crops of high value are grown. Under good management, erosion can be controlled and fertility main-

tained if the cropping system used is not more intensive than 2 years of row crops, 1 year of a small grain, and 1 year of hay. Good management includes adding fertilizer and lime, using stripcropping and diversion terraces, and seeding cover crops or returning the residue from row crops to the soil.

CAPABILITY UNIT IIe-3

This unit consists of Albrights, Braceville, Canfield, Lawrenceville, Duncannon, Pekin, Watson, Wellsboro, and Wiltshire soils. These soils are deep and moderately deep, medium textured, gently sloping, and generally moderately well drained or somewhat poorly drained. Their moisture-holding capacity is moderate to high, but a pan at a depth of 20 to 30 inches restricts the movement of water and the penetration of roots. These soils are productive, and crops grown on them respond well to fertilization. The Duncannon soil is well drained. Most of the soils in this unit formed in glacial till, but some formed on terraces, and others formed from weathered rock, or from windblown material. The Canfield and Wellsboro soils are channery, and the Pekin soil is cobbly.

The soils in this unit are well suited to all crops commonly grown in the county except wheat, potatoes, and alfalfa. Erosion can be controlled by using practices of erosion control and a cropping system that is not more intensive than 2 years of row crops, 1 year of a small grain, and 2 years of hay. The practices needed are graded stripcropping, building diversion terraces, using cover crops or returning the residue from row crops to the soils, and adding fertilizer and lime. Random closed drains can be used to drain seeps and other wet spots.

CAPABILITY UNIT IIe-4

This unit consists of shallow to moderately deep, well-drained, medium-textured and moderately coarse textured, moderately eroded Calvin, Dekalb, Lordstown, and Oquaga soils. These soils occur on gently sloping uplands. They have moderately low or low moisture-holding capacity, and crops on them respond moderately well to fertilization. Droughtiness may retard the germination of seeds and the growth of plants, and excessive amounts of channery fragments may interfere with tillage.

The soils in this unit are suited to corn, small grain, birdsfoot trefoil, and similar crops commonly grown in the county. Erosion can be controlled if the cropping system used is not more intensive than a row crop, a small grain, and hay, each grown for 1 year, if sufficient lime and fertilizer are added, and if other suitable practices are used. These practices include contour stripcropping, diversion terraces, and the seeding of cover crops or the return of the residue from row crops to the soils. Because leaching is likely, the fertilizer should be added frequently.

CAPABILITY UNIT IIe-5

This unit consists of moderately deep, moderately eroded, well-drained channery Hartleton and Leck Kill soils and shaly Berks soils. These medium-textured soils formed in glacial till on gently sloping uplands. They are friable and easily worked. Their moisture-holding capacity is moderate, and crops on them respond well to fertilization. Water and roots penetrate these soils easily.

The soils in this unit are suited to all crops commonly grown in the county. Erosion can be controlled if the cropping system used is not more intensive than 2 years of row crops, 1 year of a small grain, and 1 year of hay, if fertilizer and lime are added, and if other suitable practices are used. These practices include contour stripcropping, diversion terraces, and the seeding of cover crops or the return of the residue from row crops to the soil.

CAPABILITY UNIT IIw-1

This unit consists of deep, moderately well drained and somewhat poorly drained Basher and Middlebury soils. These medium textured and moderately coarse textured soils formed in alluvium on nearly level flood plains. They have high moisture-holding capacity, and crops on them respond well to fertilization. Floods occasionally cover these soils and leave fresh sediment, but flooding during the cropping season is rare.

The soils in this unit are suited to corn, oats, birdsfoot trefoil, and similar crops. If management that controls erosion is used, row crops can be grown continuously. This management includes adding fertilizer and lime, planting crops in graded rows, and seeding cover crops. Spring plowing should be delayed until the danger of flooding has passed. Random closed drains may be needed to drain wet spots.

CAPABILITY UNIT IIw-2

This unit is made up of deep, moderately well drained and somewhat poorly drained Albrights, Watson, and Wiltshire soils. These medium-textured, nearly level soils formed in glacial till consisting of a wide variety of materials. The water-holding capacity is high, and crops respond well to fertilization.

The soils in this unit are suited to corn, oats, birdsfoot trefoil, and similar crops. Erosion can be controlled if the crops are grown in graded rows and the cropping system used is not more intensive than 3 years of row crops, 1 year of a small grain, and 1 year of hay. Also, fertilizer and lime are needed, and cover crops should be seeded or the residue from row crops returned to the soil. Tile and surface drains may be needed to drain wet spots.

CAPABILITY UNIT IIw-3

This unit consists of deep, moderately well drained or somewhat poorly drained Braceville and Pekin soils. These medium-textured or coarse-textured soils formed in thoroughly mixed materials on nearly level glacial terraces that are underlain by a substratum of gravel. These soils are easily worked, and their moisture-holding capacity is moderate to high, but a tight layer in the subsoil restricts the movement of water and the penetration of roots. Crops respond moderately well to fertilization.

The soils in this unit are suited to corn, oats, birdsfoot trefoil, and similar crops. Row crops can be grown continuously, if they are grown in graded rows, if fertilizer and lime are added, and if cover crops are seeded or the residue from row crops is returned to the soil. Tile and surface drains may be needed to drain wet spots.

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CAPABILITY UNIT IIs-1

This unit is made up of deep, well-drained, coarse-textured Chenango soils that formed in mixed materials on nearly level and gently sloping glacial terraces. The moisture-holding capacity is low in these soils, and crops may fail in dry seasons. The crop response to fertilization is moderate to low.

The soils in this unit are suited to truck crops, corn, small grain, alfalfa, and similar crops. Irrigation may be justifiable where crops of high value are grown. On the 0 to 3 percent slopes, row crops can be grown continuously if erosion is controlled by adding fertilizer and lime, by using contour farming, and by seeding cover crops. Also desirable is returning the residue from row crops to the soil.

CAPABILITY UNIT IIs-2

The soils in this unit are moderately deep, well drained, and medium textured. They are channery Hartleton and Leck Kill soils, and they formed in glacial till in nearly level areas. These soils are friable and easily worked. Moisture and roots penetrate these soils readily, and the moisture-holding capacity is moderate. Crops respond well to fertilization, but their growth in dry periods is retarded and yields are lowered.

The soils in this unit are suited to all crops commonly grown in the county. Irrigation may be desirable where crops of high value are grown. Under good management, continuous row crops can be grown. This management includes adding fertilizer and lime, using contour farming, and seeding cover crops or returning crop residue to the soils.

CAPABILITY UNIT IIIe-1

This unit is made up of deep, well-drained Allenwood, Belmont, Lackawanna, Leck Kill, Washington, Westmoreland, and Wooster soils. These soils are moderately sloping and medium textured or moderately coarse textured. Some of them are channery. These soils are more difficult to work than less sloping soils, but slopes are not steep enough to seriously interfere with the use of most equipment. The moisture-holding capacity is good, and crops respond well to fertilization.

The soils in this unit are suited to most crops grown in the county, but yields in dry seasons are not favorable. Erosion can be controlled by using a cropping system that is not more intensive than 1 year of a row crop, 1 year of a small grain, and 2 years of hay. Also needed are fertilizer and lime, contour stripcropping, diversion terraces, and cover crops or the residue from row crops.

CAPABILITY UNIT IIIe-2

This unit consists of deep, moderately well drained or somewhat poorly drained Albrights, Alvira, Lawrenceville, Duncannon, Watson, Wellsboro, and Wiltshire soils. These soils are medium textured and moderately sloping. They have high moisture-holding capacity, and they respond well to fertilization. Except for the Albrights soil, all of these soils are moderately eroded. The Alvira soil is shaly, and the Wellsboro soil is channery.

The soils in this unit are suited to corn, oats, birdsfoot trefoil, and similar crops. Under good management, erosion can be controlled by using a cropping system that is not more intensive than 1 year of a row crop, 1 year of a small grain, and 2 years of hay. The management should provide that fertilizer and lime are added, graded stripcropping and diversion terraces are used, and cover crops are seeded or the residue from row crops is returned to the soil.

CAPABILITY UNIT IIIe-3

This unit consists of shallow to moderately deep, well-drained, moderately eroded Berks, Hartleton, Leck Kill, and Litz soils. These medium-textured soils are gently sloping to moderately sloping. Their moisture-holding capacity is moderate to low, and the degree that crops respond to fertilization depends on the amount and frequency of rainfall during the growing season. Some of these soils are channery, and some are shaly.

The soils in this unit are suited to all crops commonly grown in the county. If management is good, erosion can be controlled where row crops are grown in a cropping system that is not more intensive than 1 year of a row crop, 1 year of a small grain, and 3 years of hay. Good management includes adding fertilizer and lime, using contour stripcropping and diversion terraces, and seeding cover crops or returning the residue from row crops to the soil.

CAPABILITY UNIT IIIe-4

This unit consists of Calvin, Dekalb, Klinesville, Lordstown, Oquaga, and Weikert soils. These gently sloping to strongly sloping soils are very shallow to moderately deep and well drained or excessively drained. Some of these soils are channery, and some are shaly. Texture is medium, but there are many coarse fragments that add to the difficulty of tillage. The water-holding capacity is moderately low to very low, and the degree that crops respond to fertilization greatly depends on the availability of water.

The soils in this unit are suited to most crops grown in the county, but yields are reduced in dry seasons. Erosion can be controlled by using a cropping system that is not more intensive than 1 year of a row crop, 1 year of a small grain, and 2 years of hay. Good management includes adding fertilizer and lime, using stripcropping and diversion terraces, and seeding cover crops or returning the residue from row crops to the soil.

CAPABILITY UNIT IIIe-5

This unit consists of deep, well-drained Chenango and Laidig soils. These coarse-textured soils are moderately eroded and moderately sloping. Their moisture-holding capacity is moderately low, but when there is enough moisture available, crops respond well to fertilization. These soils are moderately easy to work. They are very porous and are penetrated easily by water and roots.

The soils in this unit are suited to corn, small grain, alfalfa, and similar crops. Erosion can be controlled if management is good and the cropping system used is not more intensive than 2 years of row crops, 1 year of a small grain, and 2 years of hay. Good management includes adding fertilizer and lime, using contour stripcropping and diversion terraces, and seeding cover crops or returning the residue from row crops to the soil.

CAPABILITY UNIT IIIw-1

This unit is made up of deep, somewhat poorly drained and poorly drained Alvira, Morris, and Ravenna soils. These medium-textured soils are gently sloping or nearly

level. They have moderate moisture-holding capacity. They dry out slowly in the spring and are difficult to work. A pan at a depth of 15 to 20 inches restricts the movement of water and the penetration of roots.

The soils in this unit are fairly well suited to corn, oats, birdsfoot trefoil, and similar crops. Erosion can be controlled if management is good and the cropping system used is not more intensive than a row crop, a small grain, and hay, each grown for 1 year. Good management includes adding fertilizer and lime, using graded stripcropping and diversion terraces, and seeding cover crops or returning the residue from row crops to the soil. Tile and surface drains are needed in some places.

CAPABILITY UNIT IIIw-2

This unit consists of deep, somewhat poorly drained to very poorly drained Atherton, Holly, and Zipp soils. These medium-textured, nearly level soils formed on flood plains and terraces. Their moisture-holding capacity is moderate, and crops on them respond well to added fertilizer. These soils are difficult to work because they dry out slowly in spring and their water table is seasonally high. Occasional flooding occurs in some areas.

The soils in this unit are fairly well suited to corn, oats, birdsfoot trefoil, and similar crops commonly grown in the county. Tile and surface drains are needed for satisfactory crop production. Organic matter and soil structure can be maintained if cover crops are seeded, fertilizer and lime are added, and the cropping system used is not more intensive than a row crop, a small grain, and hay, each grown for 1 year.

CAPABILITY UNIT IVe-1

The soils in this unit are well drained, medium textured, strongly sloping, and moderately eroded and severely eroded. They are Hartleton, Leck Kill, and Litz soils. Except for the deep Leck Kill soils, these soils are moderately deep to shallow. The moisture-holding capacity is moderate to low, and crops respond moderately well to fertilization. The coarse fragments in the surface soil make these soils difficult to work.

The soils in this unit are suited to corn, small grain, alfalfa, and similar crops. Under good management, erosion can be controlled if the cropping system is not more intensive than 1 year of a row crop, 1 year of a small grain, and 4 years of hay. Good management provides for adding fertilizer and lime, using contour stripcropping and diversion terraces, and seeding cover crops or returning the residue from row crops to the soil.

CAPABILITY UNIT IVe-2

Buchanan cobbly loam, 3 to 8 percent slopes, is the only soil in this unit. It is deep, moderately well drained coarse textured, and gently sloping. This soil formed in colluvium at the base of the steep slopes of mountains. Its moisture-holding capacity is moderate, and a tight pan at a depth of about 20 inches restricts the movement of water and the penetration of roots. Crops respond moderately well to fertilizer. The many large cobbles throughout the profile make tillage difficult.

This soil is fairly well suited to corn, small grain, and birdsfoot trefoil. Erosion can be controlled if the cropping system is not more intensive than a row crop, a small grain, and 3 years of hay, and if practices of erosion control are used. These practices are graded stripcropping, building of diversion terraces, and seeding of cover crops or returning the residue from row crops to the soil. Also needed are additions of fertilizer and lime. It may be desirable to remove stones from the surface layer so that machines can operate more easily.

CAPABILITY UNIT IVe-3

This unit is made up of shallow to moderately deep, well-drained, Calvin, Klinesville, and Weikert soils. The Calvin and Klinesville soils have a neutral substratum. These soils are medium textured, strongly sloping, and moderately eroded. Their moisture-holding capacity is low, and crop response to fertilization is moderate. Enough coarse fragments generally occur to make tillage difficult.

The soils in this unit are fairly well suited to birdsfoot trefoil and similar crops. Under good management, erosion can be controlled if the cropping system is not more intensive than 1 year of a row crop, 1 year of a small grain, and 4 years of hay. Good management includes adding fertilizer and lime, using contour stripcropping and diversion terraces, and seeding cover crops or returning the residue from row crops to the soil.

CAPABILITY UNIT IVe-4

This unit consists of deep, well-drained Lackawanna and Wooster soils that are medium textured and moderately steep. The moisture-holding capacity is high, and crop response to fertilization is good. These soils are so steep or so severely eroded that they are not suitable for intensive cultivation. Water and roots penetrate these soils easily.

The soils in this unit are suited to small grain, alfalfa, and similar crops. Slopes of more than 25 percent may be used for pasture of birdsfoot trefoil. Erosion can be controlled in areas used mostly for hay if the cropping system used is not more intensive than a small grain and 4 years or more of hay, if fertilizer and lime are added, and if contour stripcropping is used.

CAPABILITY UNIT IVe-5

This unit consists of moderately deep or deep Chenango, Hartleton, Leck Kill, Lordstown, and Oquaga soils. These soils are medium textured and moderately eroded or severely eroded. Their moisture-holding capacity is moderate, and crops on them respond moderately well to fertilization. These soils are difficult to work because they are steep.

The soils in this unit are suited to pasture of birdsfoot trefoil. Fertilizer and lime should be added. Reseeding of the pasture in contour strips is desirable.

CAPABILITY UNIT IVw-1

This unit is made up of deep and shallow, poorly drained and somewhat poorly drained Allis and Shelmadine soils. These soils are medium textured and nearly level or gently sloping. Moisture is at field capacity about half of the year, and the moisture-holding capacity is moderate. Crops respond well to fertilization. However, working these soils is generally difficult, for they are wet in spring and are extremely dry and baked late in summer.

The soils in this unit are fairly well suited to corn, small grain, birdsfoot trefoil, and similar crops, but because the soils are difficult to drain, permanent hay is a better use. Tile and surface drains are desirable if yields are to be favorable. Under good management erosion can be controlled if the cropping system used is not more intensive than a row crop, a small grain, and hay, each grown for 1 year. Good management provides for adding fertilizer and lime, using graded stripcropping and diversion terraces, and seeding cover crops or returning the residue from row crops to the soil.

CAPABILITY UNIT IVw-2

This unit consists of deep, very poorly drained Lickdale and Papakating soils. These soils are medium textured or moderately fine textured, nearly level or gently sloping, and formed in alluvium. They are ponded in local areas and are waterlogged most of the year. The Papakating soil is subject to frequent flooding. Forage crops respond well to fertilization.

Areas of the soils in this unit that have adequate outlets and are drained are suited to corn, oats, red clover, birdsfoot trefoil, and similar crops. Tile and surface drains are needed for drainage. The supply of organic matter and good soil structure can be maintained by using a cropping system that provides a small grain and long term hay. Fertilizer and lime should be added. Areas that do not have suitable outlets can be used for wildlife habitat.

CAPABILITY UNIT VIe-1

This unit consists of moderately deep to shallow Klinesville, Litz, and Weikert shaly silt loams. These soils are well drained, medium textured, moderately sloping, and severely eroded. Their moisture-holding capacity is low, and crops on them respond moderately well to fertilization. Runoff is high if the soils are unprotected.

The soils in this unit are suited to pasture planted to birdsfoot trefoil. Reseeding should be done in narrow contour strips and lime and fertilizer added.

CAPABILITY UNIT VIe-2

This unit is made up of shallow, well-drained Klinesville and Weikert soils that are medium textured, moderately steep, and moderately eroded. Their moisture-holding capacity is low, and crop response to fertilization is poor. Some of these soils are shaly, and some are channery.

The soils in this unit are mostly in trees and probably should be kept wooded. If cleared areas are seeded to birdsfoot trefoil, and lime and fertilizer are added annually, enough forage can be grown to justify the expense of seeding.

CAPABILITY UNIT VIe-3

This unit consists of well-drained, medium-textured Hartleton and Leck Kill soils that are steep and severely eroded. These soils are moderately deep in most places. Their moisture-holding capacity is moderate to low, and crop response to fertilization is moderate to good. Runoff is high if the soils are not protected. Some of these soils are channery.

The soils in this unit are suitable for trees, and pasture of birdsfoot trefoil can be grown in some places. If contour furrows are plowed before tree seedlings are planted, the seedlings will have a better chance of survival.

CAPABILITY UNIT VIs-1

This unit is made up of deep, well-drained Edgemont, Lackawanna, Laidig, Leck Kill, Wooster, and Canfield very stony soils. These soils are nearly level to steep. They have high moisture-holding capacity, but cultivation is prevented by the many large stones on the surface.

The soils in this unit are well suited to trees and are mostly wooded. In most places the Edgemont soils are burned over and grown up with scrub oak, but the other soils support stands of red oak, white oak, maple, beech, pine, hemlock, birch, and cherry. Some areas of the soils in this unit may be used for pasture. The stones on the surface interfere with seeding and management, but areas that are properly limed and fertilized produce enough good forage to justify their use for pasture. Small areas of these soils should be planted to shrubs to provide food and cover for wildlife. If the trees are cut selectively, yields of timber can be sustained.

CAPABILITY UNIT VIs-2

The soils in this unit are shallow to moderately deep, well drained, very stony, and gently sloping to strongly sloping. They are DeKalb, Hartleton, Klinesville, Leck Kill, Lordstown, Oquaga, and Weikert soils. Their moisture-holding capacity is low to moderate. Cultivation is prevented by the many large stones on the surface.

The soils in this unit are suited to trees, but stones on the surface tend to interfere with natural reseeding and to increase the difficulties of woodland management Some areas of the Dekalb soils were burned over and are in scrub oak, but most areas of the other soils support stands of merchantable timber. Trees grow somewhat more slowly on the soils of this unit than they do on soils having more moisture-holding capacity. Some areas can be used for improved pasture if enough stones are removed from the surface to permit the use of machinery. Alfalfa or birdsfoot trefoil mixed with perennial grass is suitable. Small areas should be planted to shrubs to provide food and cover for wildlife.

CAPABILITY UNIT VIs-3

This unit is made up of deep, moderately well drained or somewhat poorly drained Buchanan and Wellsboro soils that are very stony and nearly level to gently sloping. The moisture-holding capacity is moderate. The penetration of roots and water is restricted by a pan at a depth of about 2 feet.

The soils in this unit are suited to trees, but there is some windthrow hazard because the pan restricts the penetration of roots. Trees should be cut selectively so that yields are sustained. Fire lanes are easier to maintain in areas of well-drained soils adjacent to these soils. Cleared areas are suitable for limited grazing, but woodland should be protected from grazing.

CAPABILITY UNIT VIIe-1

This unit consists of very shallow to moderately deep, well-drained Calvin, Klinesville, Leck Kill, Litz, and Weikert soils that are medium textured, steep or very

steep, and mostly moderately eroded or severely eroded. The soils are very shallow and droughty. Some of them are shaly, and some are channery.

Some areas of these soils are wooded and are uneroded. The soils of this unit are suited to trees. Selective cutting should be planned so that cover is permanent and yields are sustained. Where possible, logging operations should be carried on across the slope so that runoff does not flow down the logging roads and cut gullies in them. Woodland should be protected from grazing. Forage for pasture can be grown in some areas of these soils, but yields will be low because the soils are droughty, steep, and difficult to manage. Small areas should be planted to shrubs to provide food and cover for wildlife.

CAPABILITY UNIT VIIs-1

This unit is made up of Dekalb, Klinesville, Leck Kill, Lackawanna, Oquaga, Lordstown, and Weikert soils. These soils are shallow to moderately deep, well drained, very stony, and very steep. Their moisture-holding capacity is moderate to low, but a thin layer of humus covers most areas and helps to hold moisture and retard runoff.

The soils in this unit are too steep and too stony for cultivation and are almost entirely in trees, for which they are suited. Stones may interfere with natural reseeding and cause open areas in the woodland. These open areas should be filled in by hand planting. To protect the woodland, fire lanes should be cut and maintained where needed. Overbrowsing of the understory by deer can be prevented by controlling the population of deer.

CAPABILITY UNIT VIIs-2

The only soil in this unit is Leck Kill very stony silt loam, deep, 35 to 60 percent slopes. It is deep, well drained, very stony, and very steep. The moisture-holding capacity is high, and timber production is good. A thin layer of humus on the surface helps to hold water and retard runoff.

This soil is too steep and too stony for cultivation and is almost entirely in trees, for which it is suited. Selective cutting of the trees should be planned so that the cover is permanent and yields are sustained. To protect the woodland, fire lanes should be cut and maintained where needed. Planting small areas to shrubs provides food and cover for wildlife. Forage for pasture can be grown in some areas, but the seeding and maintaining of improved pasture is not feasible.

CAPABILITY UNIT VIIs-3

This unit consists of deep, somewhat poorly drained to very poorly drained Lickdale, Morris, and Shelmadine soils. These nearly level and gently sloping soils are very stony.

The soils in this unit are suited to trees and are mostly wooded, but there is some pasture of low grade. Stones and excessive water prevent cultivation. Selective cutting should be planned for wooded areas so that yields are sustained. Travel is difficult through areas of these soils, and logging should be carried on in dry periods or when the soil is frozen. Fire is less likely than it is on well-drained soils, but some fire lanes may be needed. Windthrow is a hazard because of the shallow penetration of roots. Windblown trees should be removed as soon as possible so that good timber is not wasted and reproduction is not impaired.

CAPABILITY UNIT VIIIw-1

Mucky peat is the only soil in this unit. This deep, poorly drained, organic soil is saturated with water most of the year, but its moisture-holding capacity is moderate to low.

This soil has a water table that is permanently high and is impractical to lower by artificial drainage. In this county most areas of this soil are small; only one area is used as a source for commercial organic material. This soil is used mainly as a reservoir for water and as a habitat for waterfowl.

CAPABILITY UNIT VIIIs-1

This unit consists of Made land, Mine dumps, Riverwash, Steep very stony land, and Strip mine spoil. These land types normally support little or no vegetation. They are very steep, stony, or have other characteristics that prevent farming. Most areas do not have a continuous mantle of soil.

The use of the land types in this unit is limited to wildlife habitat, scenery, and recreation, though some areas can be planted to adapted trees. To protect the watershed, a permanent cover of vegetation should be maintained in these areas where possible. By some means the acid water that runs off from the mine dumps should be neutralized before it enters the streams.

Productivity Ratings

The soils of Columbia County vary considerably in productivity. Some consistently produce satisfactory yields of cultivated crops, and others are better suited for less intensive use. The yields in bushels or tons per acre vary on the same soil, depending on variations in current management, weather, crop varieties, and past management. Table 1 gives, for each soil in the county, ratings of relative productivity for the crops commonly grown. It also gives ratings of suitability for orchards that receive ordinary management.

In table 1 the ratings of relative productivity are given for two levels of management. The ratings in columns A are for soils under ordinary management, or management commonly followed by farmers in recent years, and the ratings in columns B are for improved management, or that suggested by the county agent and the Soil Conservation Service.

The ratings in table 1 are based on the rating of 100 assigned to represent yields of most crops on Allenwood silt loam, 0 to 3 percent slopes, under ordinary management. That soil is one of the most productive soils in Columbia County. The other soils in the county have been rated by comparing their yields with those of Allenwood silt loam, 0 to 3 percent slopes. As shown in table 1, for all the soils the rating of 100 represents 70 bushels of corn per acre, 55 bushels of oats, 32 bushels of wheat, and other yields for other crops.

TABLE 1.—*Estimated rating of relative productivity for soils used*

[In columns A are productivity ratings for soils under ordinary management, and in columns B are

Map symbol	Soil [1]	Corn (100 = 70 bu. per acre)		Oats (100 = 55 bu. per acre)		Wheat (100 = 32 bu. per acre)	
		A	B	A	B	A	B
AaA	Albrights gravelly silt loam, 0 to 3 percent slopes	70	140	80	110	75	90
AaB2	Albrights gravelly silt loam, 3 to 8 percent slopes, moderately eroded	55	130	70	100	70	90
AaC	Albrights gravelly silt loam, 8 to 15 percent slopes	50	115	60	85	60	85
AeA	Allenwood silt loam, 0 to 3 percent slopes	100	190	100	150	100	160
AeB2	Allenwood silt loam, 3 to 12 percent slopes, moderately eroded	90	170	90	130	95	150
AeC2	Allenwood silt loam, 12 to 20 percent slopes, moderately eroded	80	160	70	110	80	100
AnB2	Allis silt loam, neutral substratum, 3 to 8 percent slopes, moderately eroded.	50	100	70	100		
ArA	Alvira silt loam, 0 to 3 percent slopes	60	120	70	100		
ArB	Alvira silt loam, 3 to 8 percent slopes	60	120	70	100		
AsB2	Alvira shaly silt loam, 3 to 8 percent slopes, moderately eroded	60	120	70	100		
AsC2	Alvira shaly silt loam, 8 to 15 percent slopes, moderately eroded	60	120	75	110		
At	Atherton loam		110				
Ba	Barbour fine sandy loam	100	200	100	150	80	150
Bb	Barbour gravelly loam	90	180	100	150	75	140
Bc	Barbour silt loam	100	200	100	150	80	150
Bd	Basher fine sandy loam	90	175	100	150	50	100
BeB2	Belmont silt loam, 3 to 12 percent slopes, moderately eroded	90	170	90	130	95	150
BeC2	Belmont silt loam, 12 to 20 percent slopes, moderately eroded	80	160	85	130	85	150
BkB2	Berks shaly silt loam, 3 to 12 percent slopes, moderately eroded	75	160	90	140	90	140
BkC2	Berks shaly silt loam, 12 to 20 percent slopes, moderately eroded	60	140	80	130	80	130
BrA	Braceville loam, 0 to 3 percent slopes	95	180	100	150	80	120
BrB	Braceville loam, 3 to 8 percent slopes	80	160	95	120	80	120
BuB	Buchanan cobbly loam, 3 to 8 percent slopes						
BvB	Buchanan very stony loam, 0 to 8 percent slopes						
CaB2	Calvin shaly silt loam, neutral substratum, 3 to 12 percent slopes, moderately eroded.	80	160	90	140	90	140
CaC2	Calvin shaly silt loam, neutral substratum, 12 to 20 percent slopes, moderately eroded.	65	150	80	130	80	130
CbD2	Calvin and Klinesville soils, neutral substrata, 20 to 35 percent slopes, moderately eroded.						
CbE2	Calvin and Klinesville soils, neutral substrata, 35 to 50 percent slopes, moderately eroded.						
CfB2	Canfield channery silt loam, 3 to 8 percent slopes, moderately eroded.	55	125	70	90	70	90
CgA	Chenango gravelly sandy loam, 0 to 3 percent slopes	70	100	90	100	90	135
CgB2	Chenango gravelly sandy loam, 3 to 12 percent slopes, moderately eroded.	70	100	90	100	90	135
CgC2	Chenango gravelly sandy loam, 12 to 20 percent slopes, moderately eroded.	60	90	80	90	80	120
CgD3	Chenango gravelly sandy loam, 20 to 35 percent slopes, severely eroded.						
ChA	Chenango silt loam, 0 to 3 percent slopes	95	180	100	150	100	150
ChB2	Chenango silt loam, 3 to 12 percent slopes, moderately eroded	80	150	95	120	95	140
DaB2	Dekalb channery loam, 3 to 12 percent slopes, moderately eroded	75	160	90	140	90	140
DaC2	Dekalb channery loam, 12 to 20 percent slopes, moderately eroded	60	140	80	130	80	130
DkB	Dekalb very stony loam, 0 to 12 percent slopes						
DkD	Dekalb very stony loam, 12 to 35 percent slopes						
DkF	Dekalb very stony loam, 35 to 100 percent slopes						
EdB	Edgemont very stony loam, 0 to 12 percent slopes						
EdD	Edgemont very stony loam, 12 to 35 percent slopes						
HhA	Hartleton channery silt loam, 0 to 3 percent slopes	95	180	100	150	100	150
HhB2	Hartleton channery silt loam, 3 to 12 percent slopes, moderately eroded.	80	170	100	150	100	150
HhC2	Hartleton channery silt loam, 12 to 20 percent slopes, moderately eroded.	65	150	85	135	85	135
HhC3	Hartleton channery silt loam, 12 to 20 percent slopes, severely eroded.	50	130	70	110	70	110
HhD2	Hartleton channery silt loam, 20 to 35 percent slopes, moderately eroded.						
HhD3	Hartleton channery silt loam, 20 to 35 percent slopes, severely eroded.						

See footnotes at end of table.

for common crops, and suitability ratings for soils used for orchards [1]

ratings under improved management. Absence of a rating indicates soil is not suited to the specified crop]

Tomatoes (100 = 12 tons per acre)		Potatoes (100 = 400 bu. per acre)		Hay				Pasture				Suitability for orchards
				Alfalfa and grass (100 = 3 tons)		Birdsfoot trefoil (100 = 2 tons)		Bluegrass-clover (100 = 100 cow-acre-days [2])		Tall grass-legume (100 = 100 cow-acre-days [2])		
A	B	A	B	A	B	A	B	A	B	A	B	
75	130	70	100	80	130	90	140	50	120	60	140	Medium.
60	125	60	90	75	120	85	140	60	140	70	160	Medium.
50	100	50	80	65	100	75	125	45	110	50	150	Medium.
100	180	100	150	100	160	100	150	80	150	100	180	Good.
95	150	95	140	90	150	100	150	80	150	90	170	Good.
75	115	80	100	90	140	95	150	70	130	80	160	Good.
50	80	----	----	----	----	70	110	30	115	80	145	
50	80	----	----	----	----	70	120	40	100	50	110	Poor.
50	80	----	----	----	----	70	120	50	120	50	110	Poor.
50	80	----	----	----	----	70	120	50	120	50	110	Poor.
50	80	----	----	----	----	70	120	40	100	60	110	Poor.
----	----	----	----	----	----	50	110	20	60	0	130	
100	180	100	150	100	160	100	150	80	130	80	150	
80	140	90	130	100	160	100	150	70	120	70	140	
100	180	100	150	100	160	100	150	80	150	80	170	
80	150	80	120	----	----	75	140	60	140	70	160	
100	170	75	125	100	170	100	160	90	160	100	180	Good.
100	160	70	120	100	170	100	160	80	140	90	170	Good.
80	125	85	130	100	150	100	150	50	110	60	140	Good.
65	100	70	120	90	135	90	140	40	100	50	120	Good.
95	170	80	130	80	120	95	145	60	140	110	160	Medium.
95	170	80	130	80	120	95	145	60	140	110	170	Medium.
----	----	----	----	----	----	50	90	40	100	60	120	
----	----	----	----	----	----	----	----	30				
85	135	85	140	100	150	100	150	50	110	60	140	Good.
70	110	75	120	95	140	95	150	40	100	50	120	Good.
----	----	----	----	75	120	75	140	30	80	40	90	Poor.
----	----	----	----	----	----	----	----	20	50	20	60	
60	115	60	85	70	110	85	130	50	120	60	140	Poor.
80	125	85	110	100	150	100	150	60	110	60	130	Good.
80	125	85	110	100	150	100	150	60	100	60	120	Good.
75	115	70	95	95	140	95	140	50	80	40	90	Good.
----	----	----	----	80	135	80	135	30	60	30	70	Medium.
90	160	100	160	100	160	100	150	80	150	80	160	Good.
90	150	100	160	100	160	100	150	70	130	70	140	Good.
80	120	85	135	100	150	100	150	50	110	60	130	Medium.
65	100	80	125	90	140	90	140	40	100	50	110	Medium.
----	----	----	----	----	----	----	----	30	----	----	----	
----	----	----	----	----	----	----	----	20	0	0	0	
----	----	----	----	----	----	----	----	0	0	0	0	
----	----	----	----	----	----	----	----	30	0	0	0	
----	----	----	----	----	----	----	----	20	0	0	0	
190	140	95	150	100	150	100	150	65	125	70	150	Good.
90	140	95	150	100	150	100	150	60	120	65	145	Good.
70	110	85	135	90	135	90	140	45	105	55	125	Good.
55	95	70	115	80	120	80	120	30	85	40	100	Medium.
----	----	----	----	75	110	75	110	25	65	30	80	Medium.
----	----	----	----	65	100	65	100	20	40	25	50	Poor.

TABLE 1.—*Estimated rating of relative productivity for soils used*

Map symbol	Soil	Corn (100 = 70 bu. per acre)		Oats (100 = 55 bu. per acre)		Wheat (100 = 32 bu. per acre)	
		A	B	A	B	A	B
HrB	Hartleton very stony silt loam, 0 to 12 percent slopes	----	----	----	----	----	----
HrD	Hartleton very stony silt loam, 12 to 35 percent slopes	----	----	----	----	----	----
Hs	Holly silt loam	----	----	----	----	----	----
KaB2	Klinesville shaly silt loam, 3 to 12 percent slopes, moderately eroded	60	100	85	120	85	120
KaC2	Klinesville shaly silt loam, 12 to 20 percent slopes, moderately eroded	50	95	70	110	75	110
KaC3	Klinesville shaly silt loam, 12 to 20 percent slopes, severely eroded	50	90	65	100	65	100
KaD2	Klinesville shaly silt loam, 20 to 35 percent slopes, moderately eroded	----	----	----	----	----	----
KaD3	Klinesville shaly silt loam, 20 to 35 percent slopes, severely eroded	----	----	----	----	----	----
KkE	Klinesville and Leck Kill shaly silt loams, 35 to 70 percent slopes	----	----	----	----	----	----
KlB	Klinesville and Leck Kill very stony silt loams, 0 to 12 percent slopes	----	----	----	----	----	----
KlD	Klinesville and Leck Kill very stony silt loams, 12 to 35 percent slopes	----	----	----	----	----	----
KlF	Klinesville and Leck Kill very stony silt loams, 35 to 100 percent slopes	----	----	----	----	----	----
LaB2	Lackawanna channery loam, 3 to 12 percent slopes, moderately eroded.	100	190	100	150	100	160
LaC2	Lackawanna channery loam, 12 to 20 percent slopes, moderately eroded.	85	165	90	140	90	140
LaD2	Lackawanna channery loam, 20 to 35 percent slopes, moderately eroded.	----	----	----	----	----	----
LcB	Lackawanna very stony loam, 0 to 12 percent slopes	----	----	----	----	----	----
LcD	Lackawanna very stony loam, 12 to 35 percent slopes	----	----	----	----	----	----
LdF	Lackawanna and Oquaga very stony soils, 35 to 100 percent slopes	----	----	----	----	----	----
LeB2	Laidig gravelly loam, 3 to 12 percent slopes, moderately eroded	80	160	90	140	90	140
LeC2	Laidig gravelly loam, 12 to 20 percent slopes, moderately eroded	70	150	80	130	80	130
LfB	Laidig very stony loam, 0 to 12 percent slopes	----	----	----	----	----	----
LfD	Laidig very stony loam, 12 to 35 percent slopes	----	----	----	----	----	----
LgB	Lawrenceville and Duncannon silt loams, 3 to 8 percent slopes	90	170	100	150	100	150
LgC2	Lawrenceville and Duncannon silt loams, 8 to 12 percent slopes, moderately eroded.	75	160	85	140	85	140
LkA	Leck Kill channery silt loam, 0 to 3 percent slopes	95	180	100	150	100	150
LkB2	Leck Kill channery silt loam, 3 to 12 percent slopes, moderately eroded.	80	170	100	150	100	150
LkC2	Leck Kill channery silt loam, 12 to 20 percent slopes, moderately eroded.	65	150	85	135	85	135
LkC3	Leck Kill channery silt loam, 12 to 20 percent slopes, severely eroded	50	130	70	110	70	110
LkD2	Leck Kill channery silt loam, 20 to 35 percent slopes, moderately eroded.	----	----	----	----	----	----
LkD3	Leck Kill channery silt loam, 20 to 35 percent slopes, severely eroded	----	----	----	----	----	----
LlA	Leck Kill channery silt loam, deep, 0 to 3 percent slopes	100	190	100	150	100	160
LlB2	Leck Kill channery silt loam, deep, 3 to 12 percent slopes, moderately eroded.	100	180	100	150	100	160
LlC2	Leck Kill channery silt loam, deep, 12 to 20 percent slopes, moderately eroded.	90	160	90	150	90	160
LlC3	Leck Kill channery silt loam, deep, 12 to 20 percent slopes, severely eroded.	80	150	85	140	85	150
LmB	Leck Kill very stony silt loam, deep, 0 to 12 percent slopes	----	----	----	----	----	----
LmD	Leck Kill very stony silt loam, deep, 12 to 35 percent slopes	----	----	----	----	----	----
LmE	Leck Kill very stony silt loam, deep, 35 to 60 percent slopes	----	----	----	----	----	----
Ln	Lickdale silt loam	----	----	----	----	----	----
Lo	Lickdale very stony silt loam	----	----	----	----	----	----
LpB2	Litz silt loam, 3 to 12 percent slopes, moderately eroded	75	160	90	140	90	140
LpC2	Litz silt loam, 12 to 20 percent slopes, moderately eroded	60	140	80	130	80	130
LrC3	Litz and Weikert shaly silt loams, 12 to 20 percent slopes, severely eroded.	50	120	65	100	65	100
LrD3	Litz and Weikert shaly silt loams, 20 to 35 percent slopes, severely eroded.	----	----	----	----	----	----
LrE2	Litz and Weikert shaly silt loams, 35 to 50 percent slopes, moderately eroded.	----	----	----	----	----	----
LsB2	Lordstown channery silt loam, 3 to 12 percent slopes, moderately eroded.	60	100	85	120	85	120
LsC2	Lordstown channery silt loam, 12 to 20 percent slopes, moderately eroded.	50	90	70	110	70	110
LsD2	Lordstown channery silt loam, 20 to 35 percent slopes, moderately eroded.	----	----	----	----	----	----
LtB	Lordstown very stony silt loam, 0 to 12 percent slopes	----	----	----	----	----	----
LtD	Lordstown very stony silt loam, 12 to 35 percent slopes	----	----	----	----	----	----

See footnotes at end of table.

for common crops, and suitability ratings for soils used for orchards[1]—Continued

Tomatoes (100 = 12 tons per acre)		Potatoes (100 = 400 bu. per acre)		Hay: Alfalfa and grass (100 = 3 tons)		Hay: Birdsfoot trefoil (100 = 2 tons)		Pasture: Bluegrass-clover (100 = 100 cow-acre-days [2])		Pasture: Tall grass-legume (100 = 100 cow-acre-days [2])		Suitability for orchards
A	B	A	B	A	B	A	B	A	B	A	B	
----	----	----	----	----	----	----	----	40	----	----	----	
----	----	----	----	----	----	----	----	30	----	----	----	
----	----	----	----	----	----	50	100	10	30	0	30	
50	75	50	75	70	100	90	130	45	100	50	120	Medium.
50	70	50	65	70	100	80	120	40	90	45	100	Medium.
50	70	----	----	80	90	65	100	30	80	40	90	Medium.
----	----	----	----	60	90	65	100	30	80	40	90	Medium.
----	----	----	----	50	80	55	90	20	60	20	70	Poor.
----	----	----	----	----	----	----	----	10	30	0	40	
----	----	----	----	----	----	----	----	40	----	----	----	
----	----	----	----	----	----	----	----	30	----	----	----	
----	----	----	----	----	----	----	----	0	0	0	0	
100	180	100	150	100	160	100	150	75	140	95	170	Poor.
80	120	90	140	90	150	90	140	75	140	85	155	Poor.
----	----	----	----	80	120	80	120	60	110	70	130	Poor.
----	----	----	----	----	----	----	----	30	----	----	----	
----	----	----	----	----	----	----	----	20	0	0	0	
----	----	----	----	----	----	----	----	0	0	0	0	
80	130	90	140	100	150	100	150	75	140	95	170	Medium.
70	120	80	130	100	150	100	150	70	135	80	150	Medium.
----	----	----	----	----	----	----	----	30	----	----	----	
----	----	----	----	----	----	----	----	20	0	0	0	
100	170	90	130	85	130	90	140	80	150	100	180	Medium.
85	160	75	125	85	130	90	140	80	140	90	175	Medium.
90	140	95	150	100	150	100	150	65	125	70	150	Good.
90	140	95	150	100	150	100	150	60	120	65	145	Good.
70	110	85	135	90	135	90	140	45	105	55	125	Good.
55	95	70	115	80	120	80	120	30	85	40	100	Poor.
----	----	----	----	75	130	75	140	25	65	30	80	Medium.
----	----	----	----	70	130	70	140	20	40	25	50	Poor.
100	180	100	150	100	160	100	150	80	150	100	180	Good.
100	170	100	150	100	160	100	150	80	150	90	170	Good.
90	165	90	150	100	160	100	150	70	130	80	160	Good.
85	150	85	140	90	150	90	140	50	100	60	135	Poor.
----	----	----	----	----	----	----	----	30	----	----	----	
----	----	----	----	----	----	----	----	30	----	----	----	
----	----	----	----	----	----	----	----	0	0	0	0	
----	----	----	----	----	----	----	70	20	60	0	130	
----	----	----	----	----	----	----	----	0	0	0	0	
80	125	85	130	100	150	100	150	50	110	60	140	Good.
65	100	70	120	90	135	90	140	40	100	50	120	Good.
50	85	65	110	80	120	80	125	30	80	40	90	Poor.
----	----	----	----	65	100	65	100	20	60	20	70	Poor.
----	----	----	----	----	----	----	----	20	60	20	70	Poor.
70	130	50	80	70	100	90	130	50	100	55	125	Poor.
65	120	50	70	60	100	80	130	40	90	40	100	Poor.
----	----	----	----	50	90	70	120	30	70	30	80	Poor.
----	----	----	----	----	----	----	----	40	----	----	----	
----	----	----	----	----	----	----	----	40	----	----	----	

See footnotes at end of table.

TABLE 1.—*Estimated rating of relative productivity for soils used*

Map symbol	Soil [1]	Corn (100 = 70 bu. per acre)		Oats (100 = 55 bu. per acre)		Wheat (100 = 32 bu. per acre)	
		A	B	A	B	A	B
LtF	Lordstown very stony silt loam, 35 to 100 percent slopes	----	----	----	----	----	----
Mb	Middlebury fine sandy loam	95	180	100	150	----	----
Md	Middlebury silt loam	95	180	100	150	----	----
MrB	Morris channery silt loam, 3 to 8 percent slopes	----	110	----	----	----	----
MsB	Morris very stony silt loam, 0 to 8 percent slopes	----	----	----	----	----	----
Mu	Mucky peat	----	----	----	----	----	----
OcB2	Oquaga channery silt loam, 3 to 12 percent slopes, moderately eroded.	75	150	90	140	90	140
OcC2	Oquaga channery silt loam, 12 to 20 percent slopes, moderately eroded.	60	140	80	130	80	130
OcD2	Oquaga channery silt loam, 20 to 35 percent slopes, moderately eroded.	----	----	----	----	----	----
OsB	Oquaga very stony silt loam, 0 to 12 percent slopes	----	----	----	----	----	----
OsD	Oquaga very stony silt loam, 12 to 35 percent slopes	----	----	----	----	----	----
Pa	Papakating silty clay loam	----	----	----	----	----	----
PkA	Pekin silt loam, cobbly variant, 0 to 3 percent slopes	70	140	80	110	80	100
PkB2	Pekin silt loam, cobbly variant, 3 to 8 percent slopes, moderately eroded.	70	140	80	110	80	100
RaA	Ravenna channery silt loam, 0 to 3 percent slopes	----	110	----	----	----	----
RaB	Ravenna channery silt loam, 3 to 8 percent slopes	----	110	----	----	----	----
SdA	Shelmadine silt loam, 0 to 3 percent slopes	----	110	----	----	----	----
SdB2	Shelmadine silt loam, 3 to 8 percent slopes, moderately eroded	----	110	----	----	----	----
Sh	Shelmadine very stony silt loam	----	----	----	----	----	----
Tf	Tioga fine sandy loam	100	200	100	150	80	150
Tg	Tioga gravelly loam	90	170	100	150	80	150
Ts	Tioga silt loam	100	200	100	150	80	150
Tt	Tioga silt loam, high bottom	100	200	100	150	100	150
WaA	Washington silt loam, 0 to 3 percent slopes	100	200	100	160	100	160
WaB2	Washington silt loam, 3 to 12 percent slopes, moderately eroded	90	170	90	130	90	150
WaC2	Washington silt loam, 12 to 20 percent slopes, moderately eroded	80	160	85	130	90	140
WbA	Watson silt loam, 0 to 3 percent slopes	70	140	80	110	80	100
WbB2	Watson silt loam, 3 to 8 percent slopes, moderately eroded	60	130	75	100	75	90
WbC2	Watson silt loam, 8 to 15 percent slopes, moderately eroded	50	130	75	100	75	90
WcB2	Weikert channery silt loam, 3 to 12 percent slopes, moderately eroded.	60	100	85	120	85	120
WcC2	Weikert channery silt loam, 12 to 20 percent slopes, moderately eroded.	50	90	75	110	75	110
WcD2	Weikert channery silt loam, 20 to 35 percent slopes, moderately eroded.	----	----	----	----	----	----
WcF2	Weikert channery silt loam, 35 to 80 percent slopes, moderately eroded.	----	----	----	----	----	----
WeD	Weikert very stony silt loam, 12 to 35 percent slopes	----	----	----	----	----	----
WeF	Weikert very stony silt loam, 35 to 80 percent slopes	----	----	----	----	----	----
WfB2	Wellsboro channery silt loam, 3 to 8 percent slopes, moderately eroded.	55	125	70	90	70	90
WfC2	Wellsboro channery silt loam, 8 to 15 percent slopes, moderately eroded.	50	115	60	85	60	85
WhB	Wellsboro very stony silt loam, 0 to 8 percent slopes	----	----	----	----	----	----
WmB2	Westmoreland silt loam, 3 to 12 percent slopes, moderately eroded	90	170	90	130	95	150
WmC2	Westmoreland silt loam, 12 to 20 percent slopes, moderately eroded	80	160	85	130	85	150
WnA	Wiltshire silt loam, 0 to 3 percent slopes	75	150	80	110	80	100
WnB2	Wiltshire silt loam, 3 to 8 percent slopes, moderately eroded	75	150	80	110	80	100
WnC2	Wiltshire silt loam, 8 to 15 percent slopes, moderately eroded	65	150	70	110	70	110
WoB2	Wooster channery silt loam, 3 to 12 percent slopes, moderately eroded.	90	170	100	150	95	150
WoC2	Wooster channery silt loam, 12 to 20 percent slopes, moderately eroded.	85	165	90	140	90	140
WoD2	Wooster channery silt loam, 20 to 35 percent slopes, moderately eroded.	----	----	----	----	----	----
WpD	Wooster very stony silt loam, 12 to 35 percent slopes	----	----	----	----	----	----
WsB	Wooster and Canfield very stony loams, 0 to 12 percent slopes	----	----	----	----	----	----
Zp	Zipp silt loam	----	----	----	----	----	----

[1] Made Land, Mine dumps, Riverwash, Steep very stony land, and Strip mine spoil are not rated.

for common crops, and suitability ratings for soils used for orchards[1] Continued

Tomatoes (100 = 12 tons per acre)		Potatoes (100 = 400 bu. per acre)		Hay: Alfalfa and grass (100 = 3 tons)		Hay: Birdsfoot trefoil (100 = 2 tons)		Pasture: Bluegrass-clover (100 = 100 cow-acre-days [2])		Pasture: Tall grass-legume (100 = 100 cow-acre-days [2])		Suitability for orchards
A	B	A	B	A	B	A	B	A	B	A	B	
-----	-----	-----	-----	-----	-----	-----	-----	0	0	0	0	
95	170	80	130	80	120	95	145	60	140	70	160	
95	170	80	130	80	120	95	145	80	150	90	170	
-----	-----	-----	-----	-----	-----	50	100	20	60	25	80	
-----	-----	-----	-----	-----	-----	-----	50	0	0	0	0	
-----	-----	-----	-----	-----	-----	-----	50	0	0	0	60	
80	130	85	140	100	150	100	150	50	100	55	125	Poor.
70	110	75	120	90	130	90	140	40	90	40	100	Poor.
-----	-----	-----	-----	70	110	70	130	30	70	30	80	Poor.
-----	-----	-----	-----	-----	-----	-----	-----	40	-----	-----	-----	
-----	-----	-----	-----	-----	-----	-----	-----	30	-----	-----	-----	
-----	-----	-----	-----	-----	-----	-----	-----	20	0	0	130	
75	130	70	100	85	130	90	140	60	140	110	160	
75	130	70	100	85	130	90	140	60	140	110	170	
-----	80	-----	-----	-----	-----	50	100	20	50	25	70	
-----	80	-----	-----	-----	-----	50	100	20	60	25	80	
-----	80	-----	-----	-----	-----	50	100	35	80	70	140	
-----	80	-----	-----	-----	-----	50	100	35	80	70	140	
-----	-----	-----	-----	-----	-----	-----	50	30	-----	0	0	
100	180	100	150	100	160	100	150	80	130	80	150	
100	180	100	150	100	160	100	150	70	120	70	140	
100	180	100	150	100	160	100	150	80	150	80	170	
100	180	100	150	100	160	100	150	90	160	80	200	
100	160	90	135	100	170	100	140	85	160	110	200	Good.
100	150	75	125	100	170	100	140	85	160	100	180	Good.
90	150	70	120	100	170	100	140	75	140	90	165	Good.
75	130	70	100	80	120	90	140	50	120	60	140	Medium.
65	125	65	90	75	120	85	140	60	140	70	160	Medium.
60	125	60	90	80	125	85	140	45	110	50	150	Medium.
50	75	-----	-----	70	100	90	130	45	100	50	120	Poor.
50	70	-----	-----	70	100	90	130	40	90	45	100	Poor.
-----	-----	-----	-----	60	90	85	120	30	80	40	90	Poor.
-----	-----	-----	-----	50	80	75	100	10	30	10	40	Poor.
-----	-----	-----	-----	-----	-----	-----	-----	30	-----	-----	-----	
-----	-----	-----	-----	-----	-----	-----	-----	0	-----	-----	-----	
60	115	60	85	70	110	85	130	60	140	70	160	Poor.
50	100	50	80	65	110	75	125	45	110	50	150	Poor.
-----	-----	-----	-----	-----	-----	-----	-----	10	20	0	10	
100	170	75	125	100	170	100	160	80	150	105	175	Good.
100	160	70	120	100	170	100	160	70	130	85	160	Good.
80	140	70	100	90	140	95	145	60	130	70	150	Medium.
80	140	70	100	90	140	95	145	70	150	80	170	Medium.
70	140	60	100	90	140	95	145	50	115	50	160	Medium.
100	180	100	150	100	160	100	150	75	140	95	170	Poor.
80	120	90	140	90	150	90	150	75	140	85	155	Poor.
-----	-----	-----	-----	80	120	80	120	60	110	70	130	Poor.
-----	-----	-----	-----	50	75	50	70	0	0	0	0	
-----	-----	-----	-----	50	80	50	75	30	50	0	50	
-----	-----	-----	-----	-----	-----	-----	-----	25	60	35	80	

[2] Cow-acre-days is the number of days 1 acre can be grazed by a cow, steer, or horse, by 5 hogs, or by 7 sheep without damage to the pasture.

For any soil in table 1, the actual estimated yield per acre can be determined by a simple computation. For example, Alvira silt loam, 0 to 3 percent slopes, under ordinary management has a productivity rating of 60 for corn. By multiplying 60 by 70 (head of column for corn) and dividing by 100, we get 42. The average annual yield of corn on Alvira silt loam, 0 to 3 percent slopes, under ordinary management is 42 bushels per acre.

The yields obtained from the productivity ratings in table 1 are not intended to be the maximum yields obtainable. Yields are expected to increase as new methods and new crop varieties are developed, but the relative yields of different soils are not expected to change.

Woodland Management [1]

A dense forest covered Columbia County when it was first settled, but the virgin stands were eliminated when timber was cut to be sold and the land was cleared for farming. Beech, birch, and maple originally covered the valleys in the central part of the county. Oak and hickory grew on the mountains, and hemlock grew in the northern part. The woodland is now in trees of second and third growth. About 45 percent of the county is forest (*15*).[2] The principal forest types (*11*) that make up the present woodland and the percentage of the total woodland that each occupies (*15*) are as follows:

	Percentage of total woodland in the county
Chestnut oak	42
Chestnut oak is in pure stands or predominates; associates are scarlet oak, white oak, black oak, pitch pine, blackgum, and red maple.	
Red oak	41
Northern red oak predominates; associates are black oak, scarlet oak, chestnut oak, and yellow-poplar.	
Aspen-gray birch	4
Aspen and gray birch predominate in mixtures; associates are black cherry, northern red oak, white pine, white oak, and sugar maple.	
Hemlock	4
Eastern hemlock is in pure stands or predominates; associates are beech, sugar maple, basswood, yellow birch, red maple, black cherry, white ash, white pine, northern red oak, and white oak.	
Other or mixed types	9

Commercial forest is made up of approximately 6 percent sawtimber, 69 percent poletimber, and 25 percent seedlings and saplings. Trees grow well in this county except in areas of shallow soils and poorly drained soils. Valuable trees that grow well are red oak, black cherry, white pine, sugar maple, and tulip-poplar. These and other desirable trees could be increased by good woodland management, for the soils and the climate of the county favor forestry. A large acreage that could support white pine, red oak, and tulip-poplar is now in red maple, aspen, and birch, which are less valuable. White pine could be planted on many acres of the high plateau that now have a dense growth of white oak, which grows slowly. Of the existing woodland in the county, 27 percent is excellent for trees, 36 percent is good, 19 percent is fair, and 17 percent is poor. The remaining 1 percent is noncommercial woodland and is not rated.

Woodland suitability groups

To help in planning the management of woodland, the soils of the county have been placed in 23 woodland groups. Each group consists of soils that have about the same suitability for trees, require about the same management, and have about the same potential productivity. To meet these requirements, the soils in a group have about the same depth, drainage, and moisture-holding capacity.

Listed in table 2 are the 23 woodland suitability groups into which the soils of the county have been placed. The soils in each group are designated by their symbols. For each group are given a rating of potential productivity, suitable species to favor in management or to plant, and a rating of *slight, moderate,* or *severe* for the hazards that hinder the growth of trees. The terms used in table 2 require explanation.

Potential productivity: In table 2, potential productivity is rated *excellent, good, fair,* or *poor* on the basis of the site index of the soils for oak, excluding pin oak. The site index for a given soil is the height, in feet, that a specified kind of tree growing on that soil will reach at 50 years of age. Soils are rated *excellent* for production of timber if the site index for oak is 75 or more and the expected yield is 13,750 board feet per acre (International rule) when the stand is 50 years old. A rating of *good* indicates that the soils in a group have a site index of 65 to 74 for oak, and an expected yield of 9,750 board feet per acre when a stand is 50 years old. Soils are rated *fair* for production of timber if their site index for oak is 55 to 64 and the expected yield is 6,300 board feet when a stand is 50 years old. A rating of *poor* indicates that the site index for oak is 54 or less and the expected yield is less than 3,250 board feet per acre when a stand is 50 years old.

To determine site index, studies were made of the growth rate on 37 plots that represent 8 of the major soil series in the county. The field notes giving the location of these plots, and the measurements and other observations made, are on file in the office of the Soil Conservation Service at Harrisburg, Pa. In this study the site index is the average height of the tallest trees, in feet, at the age of 50 years. Soils in the county having characteristics similar to those of the soils studied were assumed to have approximately the same site indexes. The volume of timber that normal stands produce at different ages can be determined by using this index and applicable yield tables. Because the growth of trees can be correlated with kinds of soils, a soil map is a good management tool for helping farmers and others in deciding where woodland management will give the best results.

Suitable species: Listed under "Suitable species" in table 2 are the kinds of native trees that should be favored in management and the kinds of trees that are suitable for planting.

Seedling mortality: This term refers to the loss of naturally occurring or planted seedlings as influenced by kinds of soil or topographic conditions when plant competition is not a limiting factor. Seedling mortality is

[1] By V. C. Miles, woodland specialist, Soil Conservation Service.

[2] Italic numbers in parentheses refer to Literature Cited, p. 138.

slight if 0 to 25 percent of the seedlings are expected to die and is *moderate* if this percentage is between 25 and 50. If more than 50 percent of the seedlings are expected to die, seedling mortality is *severe*.

PLANT COMPETITION: This term refers to the rate at which brush, grass, and undesirable trees are likely to invade. Plant competition is *slight* if unwanted plants do not prevent adequate natural regeneration and early growth or do not interfere with the growth of planted seedlings. It is *moderate* if competing plants delay but do not prevent establishment of a normal fully stocked stand by natural regeneration or from planted seedlings. Competition is *severe* where natural or artificial regeneration is not adequate unless there is intensive site preparation and maintenance, including weeding.

EQUIPMENT LIMITATIONS: Steep slopes, stones, and excess water limit the use of ordinary equipment in pruning, thinning, harvesting, and other woodland management. The rating is *slight* if there are very few limitations on the type of equipment or the time of year

TABLE 2.—*Potential productivity, suitable trees, and hazards of woodland suitability groups*

Woodland suitability group [1]	Potential productivity [2]	Suitable species: Native trees to favor	Suitable species: Planted trees	Seedling mortality	Plant competition	Equipment limitations	Erosion hazard	Windthrow hazard
Group 1: Deep, well-drained soils that have high moisture-holding capacity; on flood plains with slopes of as much as 3 percent (Ba, Bb, Bc, Tf, Tg, Ts, Tt)	Excellent	Tulip-poplar, red oak, ash, white pine, black walnut.	Larch, white pine, Austrian pine, Norway spruce.	Slight	Severe	Slight	Slight	Slight.
Group 2: Deep, moderately well drained and somewhat poorly drained soils that have high moisture-holding capacity; on flood plains with slopes of as much as 3 percent (Bd, Mb, Md).	Good	Tulip-poplar, red oak, ash, white pine, black walnut.	Larch, white pine, Austrian pine, Norway spruce.	Slight	Severe	Moderate	Slight	Slight to moderate.
Group 3: Deep, poorly drained soil that has high moisture-holding capacity; on flood plains with slopes of as much as 3 percent (Hs).	Fair	White pine, hemlock, red maple.	White pine, white spruce.	Moderate	Severe	Severe	Slight	Moderate to severe.
Group 4: Deep, very poorly drained soil that has high moisture-holding capacity; on flood plains with slopes of as much as 3 percent (Pa).	Poor	White pine, hemlock, red maple.	White pine, white spruce.	Severe	Severe	Severe	Slight	Severe.

See footnotes at end of table.

TABLE 2.—*Potential productivity, suitable trees, and hazards of woodland suitability groups*—Continued

Woodland suitability group [1]	Potential productivity [2]	Suitable species		Seedling mortality	Plant competition	Equipment limitations	Erosion hazard	Windthrow hazard
		Native trees to favor	Planted trees					
Group 5: Deep, well-drained soils that have high moisture-holding capacity; on uplands with slopes of as much as 35 percent (AeA, AeB2, AeC2, LaB2, LaC2, LcB, LcD, LeB2, LeC2, LfB, LfD, WaA, WaB2, WaC2, WoB2, WoC2, WpD, WsB).	Excellent	Tulip-poplar, red oak, ash, white pine, black walnut.	Larch, white pine, Austrian pine, Norway spruce.	Slight	Severe	Slight to severe.	Slight to moderate.	Slight.
Group 6: Deep, well-drained soils that have high moisture-holding capacity; on uplands with slopes of more than 20 percent (LaD2, LdF, WoD2).	Good	Tulip-poplar, red oak, ash, white pine, black walnut.	Larch, white pine, Austrian pine, Norway spruce.	Slight	Severe	Severe	Severe	Slight.
Group 7: Deep, moderately well drained and somewhat poorly drained, permeable soils that have high moisture-holding capacity; on uplands with slopes of as much as 15 percent (BrA, BrB, LgB, LgC2, WnA, WnB2, WnC2).	Good	Tulip-poplar, red oak, ash, white pine.	Larch, white pine, Austrian pine, Norway spruce.	Slight	Severe	Moderate	Slight to moderate.	Slight to moderate.
Group 8: Deep, well-drained soils that have moderate moisture-holding capacity; on uplands with slopes of as much as 35 percent (BeB2, BeC2, CgA, CgB2, CgC2, ChA, ChB2, EdB, EdD).	Good	Tulip-poplar, red oak, ash, white pine.	Larch, white pine, Austrian pine, Norway spruce.	Slight	Severe	Severe	Severe	Slight.

See footnotes at end of table.

TABLE 2.—*Potential productivity, suitable trees, and hazards of woodland suitability groups*—Continued

Woodland suitability group [1]	Potential productivity [2]	Suitable species		Seedling mortality	Plant competition	Equipment limitations	Erosion hazard	Windthrow hazard
		Native trees to favor	Planted trees					
Group 9: Deep, well-drained soil that has moderate moisture-holding capacity; on uplands with slopes of more than 20 percent (CgD3).	Good	Tulip-poplar, red oak, ash, white pine.	Larch, white pine, Austrian pine, Norway spruce.	Slight	Severe	Severe	Severe	Slight.
Group 10: Deep, moderately well drained soils that have a pan or are fine textured and have moderate moisture-holding capacity; on uplands with slopes of as much as 15 percent (AaA, AaB2, AaC, BuB, BvB, CfB2, PkA, PkB2, WbA, WbB2, WbC2, WfB2, WfC2, WhB).	Good	Tulip-poplar, red oak, white pine, ash.	Larch, white pine, Norway spruce, Austrian pine.	Slight	Severe	Moderate or severe.	Slight to moderate.	Slight to moderate.
Group 11: Deep, poorly drained, permeable soil that has high moisture-holding capacity; on uplands with slopes of as much as 3 percent (Zp).	Fair	White pine	White pine	Moderate	Severe	Severe	Slight to moderate.	Moderate to severe.

See footnotes at end of table.

TABLE 2.—*Potential productivity, suitable trees, and hazards of woodland suitability groups*—Continued

Woodland suitability group [1]	Potential productivity [2]	Suitable species: Native trees to favor	Suitable species: Planted trees	Seedling mortality	Plant competition	Equipment limitations	Erosion hazard	Windthrow hazard
Group 12: Moderately deep, well-drained soils that have moderate moisture-holding capacity; on uplands with slopes of as much as 35 percent (BkB2, BkC2, CaB2, CaC2, DaB2, DaC2, HhA, HhB2, HhC2 HhC3, HrB, HrD, LkA, LkB2, LkC2, LkC3, LlA, LlB2, LlC2, LlC3, LmB, LmD, LpB2, LpC2, LsB2, LsC2, LtB, LtD, OcB2, OcC2, OsB, OsD, WmB2, WmC2).	Good	Tulip-poplar, red oak, white pine, ash.	Larch, white pine, Norway spruce, Austrian pine.	Slight	Severe	Slight to severe.	Slight to moderate.	Slight.
Group 13: Moderately deep, well-drained soils that have moderate moisture-holding capacity; on uplands with slopes of more than 20 percent (CbD2, CbE2, HhD2, HhD3, LkD2, LkD3, LmE, LsD2, LtF, OcD2).	Fair	Tulip-poplar, red oak, white pine.	Larch, white pine, Norway spruce, Austrian pine.	Slight	Severe	Severe	Severe	Slight.

See footnotes at end of table.

TABLE 2.—*Potential productivity, suitable trees, and hazards of woodland suitability groups*—Continued

Woodland suitability group [1]	Potential productivity [2]	Suitable species: Native trees to favor	Suitable species: Planted trees	Seedling mortality	Plant competition	Equipment limitations	Erosion hazard	Windthrow hazard
Group 14: Deep, somewhat poorly drained soils that have a pan or are fine textured and have moderate moisture-holding capacity; on uplands with slopes of as much as 15 percent (ArA, ArB, AsB2, AsC2, MrB, MsB, RaA, RaB).	Good	Tulip-poplar	Larch	Slight	Severe	Moderate or severe.	Slight to moderate.	Moderate.
Group 15: Deep, poorly drained soils that have a pan or are fine textured and have moderate moisture-holding capacity; on uplands with slopes of as much as 8 percent (SdA, SdB2, Sh).	Fair	Red oak, white pine, tulip-poplar.	White pine, white spruce	Moderate	Severe	Severe	Slight to moderate.	Moderate to severe.
Group 16: Shallow, well-drained soils that have low moisture-holding capacity; on uplands with slopes of as much as 35 percent (KaB2, KaC2, KiB, KlD, LrC3, WcB2, WcC2, WeD).	Fair	Virginia pine, red oak, black oak, white pine.	Virginia pine, white pine.	Moderate	Moderate	Slight to severe.	Slight to moderate.	Slight.
Group 17: Shallow, well-drained soils that have low moisture-holding capacity; on uplands with slopes of more than 20 percent (KaD2, KkE, KlF, LrD3, LrE2, WcD2, WcF2, WeF).	Poor	Virginia pine, red oak, black oak white pine.	Virginia pine, white pine.	Severe	Slight	Severe	Severe	Moderate.

See footnotes at end of table.

TABLE 2.—*Potential productivity, suitable trees, and hazards of woodland suitability groups*—Continued

Woodland suitability group [1]	Potential productivity [2]	Suitable species: Native trees to favor	Suitable species: Planted trees	Seedling mortality	Plant competition	Equipment limitations	Erosion hazard	Windthrow hazard
Group 18: Moderately deep, somewhat poorly drained soil that has a pan or is fine textured and has low moisture-holding capacity; on uplands with slopes of as much as 8 percent (AnB2).	Poor	Virginia pine, white pine, red maple, black oak.	Virginia pine, white pine.	Moderate	Moderate	Slight to moderate.	Slight to moderate.	Moderate.
Group 19: Moderately deep, well-drained soils that have very low moisture-holding capacity; on uplands with slopes of as much as 35 percent (DkB, DkD).	Poor	Virginia pine, chestnut oak.	Virginia pine	Severe	Slight	Severe	Slight to moderate.	Slight.
Group 20: Moderately deep, well-drained soil that has very low moisture-holding capacity; on uplands with slopes of more than 35 percent (DkF).	Poor	Virginia pine, chestnut oak.	Virginia pine	Severe	Slight	Severe	Severe	Slight.
Group 21: Very shallow, well-drained soil that has very low moisture-holding capacity; on uplands with slopes of as much as 20 percent (KaC3).	Poor	Virginia pine, chestnut oak.	Virginia pine	Severe	Slight	Slight or moderate.	Slight to moderate.	Moderate.

See footnotes at end of table.

TABLE 2.—*Potential productivity, suitable trees, and hazards of woodland suitability groups*—Continued

Woodland suitability group [1]	Potential productivity [2]	Suitable species		Seedling mortality	Plant competition	Equipment limitations	Erosion hazard	Windthrow hazard
		Native trees to favor	Planted trees					
Group 22: Very shallow, well-drained soil that has very low moisture-holding capacity; on uplands with slopes of more than 20 percent (KaD3).	Poor	Virginia pine, chestnut oak.	Virginia pine	Severe	Slight	Severe	Severe	Severe.
Group 23: Deep, very poorly drained soils that have moderate moisture-holding capacity; on uplands with slopes of as much as 8 percent (At, Ln, Lo).	Poor	Red maple, white pine, hemlock.	White pine, white spruce.	Severe	Severe	Severe	Slight or moderate.	Severe.

[1] The land types Made land, Mine dumps, Mucky peat, Riverwash, Steep very stony land, and Strip mine spoil generally are not suited to commercial trees and are not placed in a woodland group.

[2] See page 18 for interpretations of ratings.

that the equipment can be used. It is *moderate* if slopes are moderately steep, if heavy equipment is restricted by wetness during the wettest periods, or if the equipment moderately damages the roots. Equipment limitations are *severe* if many types of equipment cannot be used, if the time equipment cannot be used is more than 3 months in a year, or if the use of equipment severely damages the roots of trees and the structure and stability of the soils.

EROSION HAZARD: Hazard of erosion is rated according to the risk of erosion on well-managed woodland that is not protected by special practices. It is *slight* where only a small loss of soil is expected, even when trees are harvested. The erosion hazard is *moderate* where a moderate loss of soil is expected if runoff is not controlled and vegetative cover is not adequate for protection. Where the erosion hazard is moderate, moderate practices are needed on skid trails and logging roads immediately after trees are harvested. The erosion hazard is *severe* where steep slopes, rapid runoff, and slow infiltration and permeability make the soil susceptible to severe erosion. In these areas harvesting and other operations should be done across the slope as much as possible. It is advisable to lay out skid trails and logging roads on the mild slopes so that excess water is disposed of safely during logging. Immediately after logging, practices to control erosion are needed on the logging roads and skid trails.

WINDTHROW HAZARD: This hazard is rated on the basis of characteristics that affect the development of roots and the firmness that roots anchor the trees so that they resist the force of the wind. The windthrow hazard is *slight* if no trees are expected to be blown down by a normal wind. It is *moderate* if roots hold the trees firmly, except when the soil is excessively wet and the velocity of the wind is high. The hazard is *severe* if rooting is not deep enough to give stability. Many trees are expected to be blown down when the soil is very wet or the wind is high. Individual trees are likely to be blown over if they are released on all sides.

Use of Soils for Wildlife [3]

In Columbia County, as elsewhere, the kinds and amounts of wildlife greatly depend on the kinds of soils, though the relationship between the soils and wildlife is not always easily distinguished. The soils affect wildlife through their influence on the vegetation that supplies food and cover for the wildlife.

Under natural conditions, the patterns or combinations of vegetation in an area depend on the distribution of the various kinds of soils. An area is inhabited by the kinds of wildlife that have their habitat requirements met by the vegetation in the area. If the natural conditions in the area are altered by drainage, or by the other practices used in managing farmland or woodland, the kinds and patterns of vegetation change. With

[3] By CLAYTON L. HEINEY, wildlife biologist, Soil Conservation Service.

this change in vegetation, there may also be a change in the kinds and numbers of wildlife.

The soils in the county can be used for the development of wildlife in parks, in private and commercial shooting preserves, and in public and private refuges for wildlife. Also, ponds can be built and stocked with fish.

Kinds of wildlife in the county

Many kinds of small game, furbearers, and songbirds are abundant throughout most of Columbia County. The soils, topography, and pattern of land use are favorable for increasing the kinds and numbers of wildlife. The streams of the county provide good trout fishing and warm-water game fishing.

Cottontail rabbits are the most abundant game in the county. They are plentiful throughout the county except in the Nescopeck, Catawissa, Buck, and McCauley Mountains in the south-central part, in the Huntington Mountain in Briar Creek and Fishing Creek Townships, and in the mountains in Sugarloaf Township. These areas are in the Dekalb-Edgemont, the Lordstown-Oquaga, and the Wooster-Ravenna-Lordstown soil associations. Many cottontails live north of U.S. Highway No. 11 in the narrow area of lime-affected soils that extends from Fowlersville to Light Street. This area is in the Westmoreland-Litz soil association. Also, in that association is a small area around Jerseytown that has a large number of rabbits. Cottontails live in and around farms, but their number has decreased as a result of clean tillage.

Ring-necked pheasants live in most farming areas in the county. They are most abundant in the intensively cultivated areas in the county, particularly on bottom lands and in areas where the soils developed in material that was derived from calcareous rock. The bottom lands are in the Chenango-Barbour-Pekin association, and the soils that were derived from calcareous rock are in the Westmoreland-Litz association. Pheasants also frequent the Weikert-Hartleton and the Klinesville-Leck Kill associations. They are not so numerous in these associations as they are on the bottom lands, for these associations are not so intensively cultivated.

Gray squirrels are most abundant in areas along the edges of farm woodlots, but they are common throughout the county. Generally, squirrels prefer the edges of woodland and the openings in the woodland to large unbroken tracts. They are generally found in oak-hickory woodland, especially where the woodland is interspersed with cornfields. Woodland of this kind is common in the Weikert-Hartleton and the Oquaga-Wellsboro-Morris soil associations along the northwestern edge of the county and in the Laidig-Buchanan and the Dekalb-Edgemont associations in the south-central and southern parts.

Except in the mountainous areas, groundhogs are plentiful throughout the county. A large number of groundhogs are killed each year, and many more could be killed. Farmers and other landowners permit the hunting of groundhogs.

Ruffed grouse are plentiful in areas north of Iola along Little Fishing Creek and Spruce Run and in most of the mountainous areas in the county. They are also found in the many small woodlots. Ruffed grouse prefer young pines and hardwoods in brushy stands that have openings in them. Most of these areas are in the Weikert-Hartleton, the Berks-Watson, the Oquaga-Wellsboro-Morris, and the Dekalb-Edgemont associations.

Mourning doves thrive near fields of corn and small grain in the Chenango-Barbour-Pekin, the Westmoreland-Litz, the Weikert-Hartleton, and the Klinesville-Leck Kill soil associations. Mourning doves prefer to nest and roost in trees that are in or at the edge of open areas. They do not like dense forest, but many nest among the pine plantations. Doves will travel a considerable distance from roosting and nesting places to feeding areas.

Woodcock are found in limited numbers in isolated areas in the county. They are in the Chenango-Barbour-Pekin soil association along Little Fishing, Huntington, West, Catawissa, and Roaring Creeks.

In Columbia County, bobwhite quail are found in limited numbers in areas where small fields of corn or other grain adjoin meadows, brushy areas, or small woodlots. They are fewer in extensive areas of open farmland. Also, the severe winters have limited the number of bobwhite quail in this county. The quail are favored by most landowners and other farmers because of their esthetic value and because they eat undesirable insects. They live in the Westmoreland-Litz soil association near Jerseytown and in Montour and Hemlock Townships. Quail are also found in the Chenango-Barbour-Pekin soil association on a narrow band along the Susquehanna River in the central part of the county.

White-tailed deer are plentiful throughout the county. They are considered forest species, but they do not thrive in large mature forests. They prefer areas consisting of brush or young trees, lesser amounts of mature trees, and small open areas. In areas of this kind, the woodland is interspersed with farmland. Such areas are common in the Laidig-Buchanan soil association, the Dekalb-Edgemont soil association, and in other soil associations in the county.

A small number of bears inhabit areas along the Lycoming County line and the Sullivan County line, particularly in the Lordstown-Oquaga soil association.

Muskrats, the principal furbearers, live in all of the soil associations in the county. They are found in farming areas near small streams and farm ponds. Raccoon, opossum, and skunk are abundant throughout the county. Mink are less numerous but are sought by trappers more than are the other furbearers. Beaver, in limited numbers, live in the Chenango-Barbour-Pekin soil association. Red fox and gray fox are abundant in all the soil associations in the county.

Waterfowl, mainly mallards, black ducks, wood ducks, and Canada geese, can be found in poorly drained and very poorly drained areas throughout the county and also in the Chenango-Barbour-Pekin association. The North Branch of the Susquehanna River and Roaring Creek Watershed Reservoir are the major waterfowl areas of the county.

Nongame birds and animals are numerous in the county. Many of them, particularly the songbirds, are important because they have esthetic value and they eat insects and the seeds of harmful weeds.

Suitability of soils for wildlife

In table 3 most of the soils of the county are rated according to their suitability for elements of wildlife habitat and for kinds of wildlife. The land types Made land, Mine dumps, Mucky peat, Riverwash, and Strip mine spoil are not included in the table. The categories rated in table 3 are described in the following paragraphs.

Grain and seed crops consist of domestic grains or seed-producing annual herbaceous plants that are planted to produce food for wildlife. Examples are corn, sorghum, wheat, millet, buckwheat, soybeans, and sunflower.

Grasses and legumes are domestic perennial grasses and herbaceous legumes that are planted to furnish food and cover for wildlife. Examples are fescue, bromegrass, bluegrass, timothy, redtop, orchardgrass, reed canarygrass, clover, and trefoil, alfalfa, and sericea lespedeza.

Wild herbaceous upland plants are native or introduced perennial grasses or forbs (weeds) that generally are established naturally and that provide food and cover mainly for upland wildlife. Examples are ragweed, wheatgrass, wildrye, oatgrass, pokeweed, strawberry, beggarweed, goldenrod, and dandelion.

Hardwood woodland plants are deciduous trees, shrubs, and woody vines that produce fruit, nuts, buds, catkins, twigs, or foliage used extensively as food for wildlife and that commonly are established naturally but also may be planted. Examples are oak, beech, cherry, hawthorn, dogwood, viburnum, holly, maple, birch, and poplar. Smaller plants are grape, honeysuckle, blueberry, briers, greenbrier, raspberry, and rose.

Coniferous woodland plants are cone-bearing trees and shrubs that are important to wildlife primarily as cover but that also furnish food in the form of browse, seeds, or cones. These trees and shrubs are commonly established naturally, but they also may be planted. Examples are pine, spruce, white-cedar, hemlock, fir, redcedar, juniper, and yew.

Wetland food and cover plants are annual and perennial wild plants on moist to wet sites. These plants do not include submerged or floating aquatic plants that produce the food and cover used mainly by wetland wildlife. Examples of wetland food plants are smartweed, wild millet, bulrush, sedge, wildrice, switchgrass, reed canarygrass, and cattail.

Shallow water developments are areas of water that have been made by building low dikes or levees, by digging shallow excavations, or using devices to control the water in marshy streams or channels.

Excavated ponds are dug-out areas or combinations of dug-out areas and low dikes that hold water of suitable quality and depth and in ample supply for fish or wildlife. Such a pond should have a surface area of at least one-quarter acre and an average depth of 6 feet or more in at least one-fourth of the area. Also required is a water table that is permanently high or another source of unpolluted water of low acidity.

Making up the category *openland wildlife* are the birds and mammals commonly found in crop fields, in meadows and pastures, and on nonforested, overgrown land. Among these birds and mammals are quail, ring-necked pheasants, mourning doves, woodcocks, cottontail rabbits, meadowlarks, killdeer, and field sparrows.

Woodland wildlife consists of birds and mammals commonly found in wooded areas. Examples are ruffed grouse, wild turkeys, deer, squirrels, raccoons, wood thrushes, warblers, and vireos.

Wetland wildlife consists of birds and mammals commonly found in marshes and swamps. Examples are ducks, geese, herons, snipes, rails, coots, muskrats, mink, and beavers.

Engineering Applications [4]

This soil survey for Columbia County contains information that can be used by engineers to—

(1) Make soil and land use studies that will aid in selecting and developing business, industrial, recreational, and residential sites.
(2) Make preliminary estimates of the soil properties that are important in planning agricultural drainage systems, diversion terraces, irrigation systems, and farm ponds.
(3) Locate sources of sand, gravel, and other construction material.
(4) Make preliminary evaluations of soil and ground conditions that will aid in selecting highway and airport locations and in planning detailed investigations at the selected locations.
(5) Determine the suitability of soils for drainage and as sites for the disposal of waste from septic tanks.
(6) Determine the suitability of soils for cross-country movement of vehicles and construction equipment.
(7) Supplement information obtained from other published maps and reports and from aerial photographs for the purpose of making soil maps and reports that can be used readily by engineers.
(8) Correlate the performance of pipelines, pavement, and other engineering structures with soil types to develop information that will be useful in the design, installation, and maintenance of the structures.
(9) Make estimates of runoff and erosion characteristics for use in designing drainage systems, dams, and other structures for soil and water conservation.
(10) Determine the nature of material, the depth to bedrock, and other characteristics that may aid the engineer when he plans excavations for buildings and other structures.

With the use of the soil map for identification, the engineering interpretations in this subsection can be useful for many purposes. It should be emphasized, however, that the interpretations may not eliminate the need for sampling and testing at the site of specific engineering works where loads are heavy and where the excavations are deeper than the depths of layers here reported. Even in these situations, the soil map is useful for planning more detailed field investigations and for suggesting the kinds of problems that may be expected.

[4] By BERTON E. DAVIS, agricultural engineer, Soil Conservation Service.

TABLE 3.—*Suitability of soils for elements of wildlife habitat and for kinds of wildlife*

[A rating of 1 denotes well suited; 2 denotes suitable; 3 denotes poorly suited; and 4 denotes not suitable]

Map symbol	Soil	Elements of wildlife habitat: Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood woodland plants	Coniferous woodland plants	Wetland food and cover plants	Shallow water developments	Excavated ponds	Kinds of wildlife: Openland wildlife	Woodland wildlife	Wetland wildlife
AaA	Albrights gravelly silt loam, 0 to 3 percent slopes.	2	1	1	1	3	3	3	3	1	1	3
AaB2	Albrights gravelly silt loam, 3 to 8 percent slopes, moderately eroded.	2	1	1	1	3	4	4	4	1	1	4
AaC	Albrights gravelly silt loam, 8 to 15 percent slopes.	2	1	1	1	3	4	4	4	1	1	4
AeA	Allenwood silt loam, 0 to 3 percent slopes.	1	1	1	1	3	4	4	4	1	1	4
AeB2	Allenwood silt loam, 3 to 12 percent slopes, moderately eroded.	2	1	1	1	3	4	4	4	1	1	4
AeC2	Allenwood silt loam, 12 to 20 percent slopes, moderately eroded.	3	2	1	1	3	4	4	4	2	2	4
AnB2	Allis silt loam, neutral substratum, 3 to 8 percent slopes, moderately eroded.	4	4	3	3	3	3	4	1	4	4	3
ArA	Alvira silt loam, 0 to 3 percent slopes.	2	2	1	1	1	4	2	2	1	1	3
ArB	Alvira silt loam, 3 to 8 percent slopes.	2	1	1	1	1	4	4	2	1	1	4
AsB2	Alvira shaly silt loam, 3 to 8 percent slopes, moderately eroded.	3	2	2	2	2	2	4	2	2	2	3
AsC2	Alvira shaly silt loam, 8 to 15 percent slopes, moderately eroded.	3	2	2	2	2	2	4	4	2	2	3
At	Atherton loam	4	3	3	1	1	1	1	1	3	1	1
Ba	Barbour fine sandy loam	1	1	1	1	3	4	4	4	1	1	4
Bb	Barbour gravelly loam	1	1	1	1	3	4	4	4	1	1	4
Bc	Barbour silt loam	1	1	1	1	3	4	4	4	1	1	4
Bd	Basher fine sandy loam	2	1	1	1	3	3	4	4	3	1	2
BeB2	Belmont silt loam, 3 to 12 percent slopes, moderately eroded.	2	1	1	1	3	4	4	4	1	1	4
BeC2	Belmont silt loam, 12 to 20 percent slopes, moderately eroded.	3	2	1	1	3	4	4	4	2	2	4
BkB2	Berks shaly silt loam, 3 to 12 percent slopes, moderately eroded.	3	3	2	2	2	4	4	4	3	2	4
BkC2	Berks shaly silt loam, 12 to 20 percent slopes, moderately eroded.	4	3	2	2	2	4	4	4	3	2	4
BrA	Braceville loam, 0 to 3 percent slopes.	2	1	1	1	3	3	3	3	1	1	3
BrB	Braceville loam, 3 to 8 percent slopes.	2	1	1	1	3	4	4	4	1	1	4
BuB	Buchanan cobbly loam, 3 to 8 percent slopes.	2	1	1	1	3	4	4	4	1	1	4
BvB	Buchanan very stony loam, 0 to 8 percent slopes.	4	3	1	1	3	4	4	4	3	2	4
CaB2	Calvin shaly silt loam, neutral substratum, 3 to 12 percent slopes, moderately eroded.	3	3	2	2	2	4	4	4	3	2	4
CaC2	Calvin shaly silt loam, neutral substratum, 12 to 20 percent slopes, moderately eroded.	4	3	2	2	2	4	4	4	3	2	4
CbD2	Calvin and Klinesville soils, neutral substrata, 20 to 35 percent slopes, moderately eroded.	4	3	2	2	2	4	4	4	3	2	4

TABLE 3.—*Suitability of soils for elements of wildlife habitat and for kinds of wildlife*—Continued

Map symbol	Soil	Elements of wildlife habitat: Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood woodland plants	Coniferous woodland plants	Wetland food and cover plants	Shallow water developments	Excavated ponds	Kinds of wildlife: Openland wildlife	Woodland wildlife	Wetland wildlife
CbE2	Calvin and Klinesville soils, neutral substrata, 35 to 50 percent slopes, moderately eroded.	4	4	2	2	2	4	4	4	3	2	4
CfB2	Canfield channery silt loam, 3 to 8 percent slopes, moderately eroded.	2	1	1	1	3	4	4	4	1	1	4
CgA	Chenango gravelly sandy loam, 0 to 3 percent slopes.	2	1	2	2	2	4	4	4	1	2	4
CgB2	Chenango gravelly sandy loam, 3 to 12 percent slopes, moderately eroded.	2	1	2	2	2	4	4	4	1	2	4
CgC2	Chenango gravelly sandy loam, 12 to 20 percent slopes, moderately eroded.	3	2	2	2	2	4	4	4	2	2	4
CgD3	Chenango gravelly sandy loam, 20 to 35 percent slopes, severely eroded.	4	3	2	2	3	4	4	4	3	2	4
ChA	Chenango silt loam, 0 to 3 percent slopes.	1	1	1	1	3	4	4	4	1	1	4
ChB2	Chenango silt loam, 3 to 12 percent slopes, moderately eroded.	2	1	1	1	3	4	4	4	1	1	4
DaB2	Dekalb channery loam, 3 to 12 percent slopes, moderately eroded.	2	2	2	2	2	4	4	4	2	2	4
DaC2	Dekalb channery loam, 12 to 20 percent slopes, moderately eroded.	3	2	2	2	2	4	4	4	2	2	4
DkB	Dekalb very stony loam, 0 to 12 percent slopes.	4	3	2	2	2	4	4	4	3	2	4
DkD	Dekalb very stony loam, 12 to 35 percent slopes.	4	3	2	2	2	4	4	4	3	2	4
DkF	Dekalb very stony loam, 35 to 100 percent slopes.	4	4	2	2	2	4	4	4	3	2	4
EdB	Edgemont very stony loam, 0 to 12 percent slopes.	4	3	2	2	2	4	4	4	3	2	4
EdD	Edgemont very stony loam, 12 to 35 percent slopes.	4	3	2	2	2	4	4	4	3	2	4
HhA	Hartleton channery silt loam, 0 to 3 percent slopes.	2	2	2	2	2	4	4	4	2	2	4
HhB2	Hartleton channery silt loam, 3 to 12 percent slopes, moderately eroded.	2	2	2	2	2	4	4	4	2	2	4
HhC2	Hartleton channery silt loam, 12 to 20 percent slopes, moderately eroded.	3	2	2	2	2	4	4	4	2	2	4
HhC3	Hartleton channery silt loam, 12 to 20 percent slopes, severely eroded.	4	3	2	2	2	4	4	4	3	2	4
HhD2	Hartleton channery silt loam, 20 to 35 percent slopes, moderately eroded.	4	3	2	2	2	4	4	4	3	2	4
HhD3	Hartleton channery silt loam, 20 to 35 percent slopes, severely eroded.	4	4	2	2	2	4	4	4	3	2	4
HrB	Hartleton very stony silt loam, 0 to 12 percent slopes.	4	4	3	3	3	4	4	4	4	4	4
HrD	Hartleton very stony silt loam, 12 to 35 percent slopes.	4	4	3	3	3	4	4	4	4	4	4
Hs	Holly silt loam	4	3	3	1	1	1	3	4	3	1	2
KaB2	Klinesville shaly silt loam, 3 to 12 percent slopes, moderately eroded.	3	3	2	2	2	4	4	4	3	2	4

TABLE 3.—*Suitability of soils for elements of wildlife habitat and for kinds of wildlife*—Continued

Map symbol	Soil	Elements of wildlife habitat								Kinds of wildlife		
		Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood woodland plants	Coniferous woodland plants	Wetland food and cover plants	Shallow water developments	Excavated ponds	Openland wildlife	Woodland wildlife	Wetland wildlife
KaC2	Klinesville shaly silt loam, 12 to 20 percent slopes, moderately eroded.	4	3	2	2	2	4	4	4	3	2	4
KaC3	Klinesville shaly silt loam, 12 to 20 percent slopes, severely eroded.	4	4	3	3	3	4	4	4	4	4	4
KaD2	Klinesville shaly silt loam, 20 to 35 percent slopes, moderately eroded.	4	3	2	2	2	4	4	4	3	2	4
KaD3	Klinesville shaly silt loam, 20 to 35 percent slopes, severely eroded.	4	4	3	3	3	4	4	4	4	4	4
KkE	Klinesville and Leck Kill shaly silt loams, 35 to 70 percent slopes.	4	4	3	3	3	4	4	4	4	4	4
KlB	Klinesville and Leck Kill very stony silt loams, 0 to 12 percent slopes.	4	4	3	3	3	4	4	4	4	4	4
KlD	Klinesville and Leck Kill very stony silt loams, 12 to 35 percent slopes.	4	4	3	3	3	4	4	4	4	4	4
KlF	Klinesville and Leck Kill very stony silt loams, 35 to 100 percent slopes.	4	4	4	4	4	4	4	4	4	4	4
LaB2	Lackawanna channery loam, 3 to 12 percent slopes, moderately eroded.	2	1	1	1	3	4	4	4	1	1	4
LaC2	Lackawanna channery loam, 12 to 20 percent slopes, moderately eroded.	3	2	1	1	3	4	4	4	2	2	4
LaD2	Lackawanna channery loam, 20 to 35 percent slopes, moderately eroded.	4	3	1	1	3	4	4	4	3	2	4
LcB	Lackawanna very stony loam, 0 to 12 percent slopes.	4	3	1	1	3	4	4	4	3	2	4
LcD	Lackawanna very stony loam, 12 to 35 percent slopes.	4	3	1	1	3	4	4	4	3	2	4
LdF	Lackawanna and Oquaga very stony soils, 35 to 100 percent slopes (Lackawanna soil only; see Oquaga very stony silt loam, 12 to 35 percent slopes, for rating of Oquaga soil).	4	4	1	1	3	4	4	4	3	2	4
LeB2	Laidig gravelly loam, 3 to 12 percent slopes, moderately eroded.	2	1	1	1	3	4	4	4	1	1	4
LeC2	Laidig gravelly loam, 12 to 20 percent slopes, moderately eroded.	3	2	1	1	3	4	4	4	2	2	4
LfB	Laidig very stony loam, 0 to 12 percent slopes.	4	3	1	1	3	4	4	4	3	2	4
LfD	Laidig very stony loam, 12 to 35 percent slopes.	4	3	1	1	3	4	4	4	3	2	4
LgB	Lawrenceville and Duncannon silt loams, 3 to 8 percent slopes.	2	1	1	1	3	4	4	4	1	1	4
LgC2	Lawrenceville and Duncannon silt loams, 8 to 12 percent slopes, moderately eroded.	3	2	1	1	3	4	4	4	2	2	4
LkA	Leck Kill channery silt loam, 0 to 3 percent slopes.	2	2	2	2	2	4	4	4	2	2	4
LkB2	Leck Kill channery silt loam, 3 to 12 percent slopes, moderately eroded.	2	2	2	2	2	4	4	4	2	2	4

TABLE 3.—*Suitability of soils for elements of wildlife habitat and for kinds of wildlife*—Continued

Map symbol	Soil	Elements of wildlife habitat								Kinds of wildlife		
		Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood woodland plants	Coniferous woodland plants	Wetland food and cover plants	Shallow water developments	Excavated ponds	Openland wildlife	Woodland wildlife	Wetland wildlife
LkC2	Leck Kill channery silt loam, 12 to 20 percent slopes, moderately eroded.	3	2	2	2	2	4	4	4	2	2	4
LkC3	Leck Kill channery silt loam, 12 to 20 percent slopes, severely eroded.	4	3	2	2	2	4	4	4	3	2	4
LkD2	Leck Kill channery silt loam, 20 to 35 percent slopes, moderately eroded.	4	3	2	2	2	4	4	4	3	2	4
LkD3	Leck Kill channery silt loam, 20 to 35 percent slopes, severely eroded.	4	4	2	2	2	4	4	4	3	2	4
LlA	Leck Kill channery silt loam, deep, 0 to 3 percent slopes.	1	1	1	1	1	4	4	4	1	1	4
LlB2	Leck Kill channery silt loam, deep, 3 to 12 percent slopes, moderately eroded.	1	1	1	1	1	4	4	4	1	1	4
LlC2	Leck Kill channery silt loam, deep, 12 to 20 percent slopes, moderately eroded.	2	2	1	1	1	4	4	4	1	1	4
LlC3	Leck Kill channery silt loam, deep, 12 to 20 percent slopes, severely eroded.	2	2	2	2	2	4	4	4	2	2	4
LmB	Leck Kill very stony silt loam, deep, 0 to 12 percent slopes.	4	3	2	2	2	4	4	4	3	2	4
LmD	Leck Kill very stony silt loam, deep, 12 to 35 percent slopes.	4	3	2	2	2	4	4	4	3	2	4
LmE	Leck Kill very stony silt loam, deep, 35 to 60 percent slopes.	4	4	2	2	2	4	4	4	3	4	4
Ln	Lickdale silt loam	4	3	3	1	1	1	1	1	3	1	1
Lo	Lickdale very stony silt loam	4	3	3	1	1	1	2	2	3	1	1
LpB2	Litz silt loam, 3 to 12 percent slopes, moderately eroded.	3	3	2	2	2	4	4	4	3	2	4
LpC2	Litz silt loam, 12 to 20 percent slopes, moderately eroded.	4	3	2	2	2	4	4	4	3	2	4
LrC3	Litz and Weikert shaly silt loams, 12 to 20 percent slopes, severely eroded.	4	3	2	2	2	4	4	4	3	2	4
LrD3	Litz and Weikert shaly silt loams, 20 to 35 percent slopes, severely eroded.	4	4	2	2	2	4	4	4	3	3	4
LrE2	Litz and Weikert shaly silt loams, 35 to 50 percent slopes, moderately eroded.	4	4	2	2	2	4	4	4	3	3	4
LsB2	Lordstown channery silt loam, 3 to 12 percent slopes, moderately eroded.	2	2	2	2	2	4	4	4	2	2	4
LsC2	Lordstown channery silt loam, 12 to 20 percent slopes, moderately eroded.	3	2	2	2	2	4	4	4	3	2	4
LsD2	Lordstown channery silt loam, 20 to 35 percent slopes, moderately eroded.	4	3	2	2	2	4	4	4	3	2	4
LtB	Lordstown very stony silt loam, 0 to 12 percent slopes.	4	4	2	2	2	4	4	4	3	3	4
LtD	Lordstown very stony silt loam, 12 to 35 percent slopes.	4	4	2	2	2	4	4	4	3	3	4
LtF	Lordstown very stony silt loam, 35 to 100 percent slopes.	4	4	3	3	3	4	4	4	4	4	4
Mb	Middlebury fine sandy loam	2	1	1	2	2	2	3	3	1	2	3
Md	Middlebury silt loam	2	1	1	2	2	2	3	3	1	2	3

TABLE 3.—*Suitability of soils for elements of wildlife habitat and for kinds of wildlife*—Continued

Map symbol	Soil	Elements of wildlife habitat								Kinds of wildlife		
		Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood woodland plants	Coniferous woodland plants	Wetland food and cover plants	Shallow water developments	Excavated ponds	Openland wildlife	Woodland wildlife	Wetland wildlife
MrB	Morris channery silt loam, 3 to 8 percent slopes.	3	3	2	2	2	3	4	4	3	2	4
MsB	Morris very stony silt loam, 0 to 8 percent slopes.	4	3	2	2	2	3	4	4	4	2	4
OcB2	Oquaga channery silt loam, 3 to 12 percent slopes, moderately eroded.	2	2	2	2	2	4	4	4	2	2	4
OcC2	Oquaga channery silt loam, 12 to 20 percent slopes, moderately eroded.	3	2	2	2	2	4	4	4	2	2	4
OcD2	Oquaga channery silt loam, 20 to 35 percent slopes, moderately eroded.	4	4	3	3	3	4	4	4	4	4	4
OsB	Oquaga very stony silt loam, 0 to 12 percent slopes.	4	3	2	2	2	4	4	4	3	2	4
OsD	Oquaga very stony silt loam, 12 to 35 percent slopes.	4	3	2	2	2	4	4	4	3	2	4
Pa	Papakating silty clay loam	4	3	3	1	1	1	4	4	3	1	3
PkA	Pekin silt loam, cobbly variant, 0 to 3 percent slopes.	3	2	2	2	2	4	3	3	2	2	4
PkB2	Pekin silt loam, cobbly variant, 3 to 8 percent slopes, moderately eroded.	2	1	1	2	2	4	4	3	1	2	4
RaA	Ravenna channery silt loam, 0 to 3 percent slopes.	3	3	2	2	2	2	2	2	3	2	2
RaB	Ravenna channery silt loam, 3 to 8 percent slopes.	3	3	2	2	2	3	4	4	3	2	4
SdA	Shelmadine silt loam, 0 to 3 percent slopes.	3	3	2	2	2	1	1	1	3	2	1
SdB2	Shelmadine silt loam, 3 to 8 percent slopes, moderately eroded.	3	3	2	2	2	3	4	4	3	2	4
Sh	Shelmadine very stony silt loam	4	3	2	2	2	1	2	2	3	2	1
Sp	Steep very stony land	4	4	4	4	4	4	4	4	4	4	4
Tf	Tioga fine sandy loam	1	1	1	1	3	4	4	4	1	1	4
Tg	Tioga gravelly loam	1	1	1	1	3	4	4	4	1	1	4
Ts	Tioga silt loam	1	1	1	1	3	4	4	4	1	1	4
Tt	Tioga silt loam, high bottom	1	1	1	1	3	4	4	4	1	1	4
WaA	Washington silt loam, 0 to 3 percent slopes.	1	1	1	1	3	4	4	4	1	1	4
WaB2	Washington silt loam, 3 to 12 percent slopes, moderately eroded.	2	1	1	1	3	4	4	4	1	1	4
WaC2	Washington silt loam, 12 to 20 percent slopes, moderately eroded.	3	2	1	1	3	4	4	4	2	2	4
WbA	Watson silt loam, 0 to 3 percent slopes.	2	1	1	1	3	3	3	3	1	1	3
WbB2	Watson silt loam, 3 to 8 percent slopes, moderately eroded.	2	1	1	1	3	4	4	4	1	1	4
WbC2	Watson silt loam, 8 to 15 percent slopes, moderately eroded.	4	1	1	1	3	4	4	4	1	1	4
WcB2	Weikert channery silt loam, 3 to 12 percent slopes, moderately eroded.	3	3	2	2	2	4	4	4	3	2	4
WcC2	Weikert channery silt loam, 12 to 20 percent slopes, moderately eroded.	4	3	2	2	2	4	4	4	3	2	4
WcD2	Weikert channery silt loam, 20 to 35 percent slopes, moderately eroded.	4	3	2	2	2	4	4	4	3	2	4
WcF2	Weikert channery silt loam, 35 to 80 percent slopes, moderately eroded.	4	4	2	2	2	4	4	4	3	2	4

TABLE 3.—*Suitability of soils for elements of wildlife habitat and for kinds of wildlife*—Continued

Map symbol	Soil	Elements of wildlife habitat								Kinds of wildlife		
		Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood woodland plants	Coniferous woodland plants	Wetland food and cover plants	Shallow water developments	Excavated ponds	Openland wildlife	Woodland wildlife	Wetland wildlife
WeD	Weikert very stony silt loam, 12 to 35 percent slopes.	4	4	4	4	4	4	4	4	4	4	4
WeF	Weikert very stony silt loam, 35 to 80 percent slopes.	4	4	4	4	4	4	4	4	4	4	4
WfB2	Wellsboro channery silt loam, 3 to 8 percent slopes, moderately eroded.	2	1	1	1	3	4	4	4	1	1	4
WfC2	Wellsboro channery silt loam, 8 to 15 percent slopes, moderately eroded.	2	1	1	1	3	4	4	4	1	1	4
WhB	Wellsboro very stony silt loam, 0 to 8 percent slopes.	4	3	1	1	3	4	4	4	3	2	4
WmB2	Westmoreland silt loam, 3 to 12 percent slopes, moderately eroded.	2	1	1	1	3	4	4	4	1	1	4
WmC2	Westmoreland silt loam, 12 to 20 percent slopes, moderately eroded.	3	2	1	1	3	4	4	4	2	2	4
WnA	Wiltshire silt loam, 0 to 3 percent slopes.	2	1	1	1	3	3	3	3	1	1	3
WnB2	Wiltshire silt loam, 3 to 8 percent slopes, moderately eroded.	2	1	1	1	3	4	4	4	1	1	4
WnC2	Wiltshire silt loam, 8 to 15 percent slopes, moderately eroded.	2	1	1	1	3	4	4	4	1	1	4
WoB2	Wooster channery silt loam, 3 to 12 percent slopes, moderately eroded.	2	1	1	1	3	4	4	4	1	1	4
WoC2	Wooster channery silt loam, 12 to 20 percent slopes, moderately eroded.	3	2	1	1	3	4	4	4	1	2	4
WoD2	Wooster channery silt loam, 20 to 35 percent slopes, moderately eroded.	4	3	1	1	3	4	4	4	3	2	4
WpD	Wooster very stony silt loam, 12 to 35 percent slopes.	4	3	1	1	3	4	4	4	3	2	4
WsB	Wooster and Canfield very stony loams, 0 to 12 percent slopes.	4	3	1	1	3	4	4	4	3	2	4
Zp	Zipp silt loam	4	3	3	1	1	1	1	1	3	1	1

Some terms used by soil scientists may not be familiar to engineers, and other terms may have a special meaning in soil science. These terms are defined in the Glossary at the back of the report.

Much of the information in this subsection is in tables. Table 4 gives the engineering test data obtained when the samples of selected soil series were tested. Estimates of the physical properties of the soils in the county are listed in table 5, and interpretations of these properties are given in table 6.

Engineering classification systems

Engineers commonly use two classification systems in which symbols express relative suitability of soil material for use in structures. In table 5 the soils of the county are classified according to both systems.

Most highway engineers classify soil material according to the system approved by the American Association of State Highway Officials (AASHO) (*1*, *8*). In this system soil material is classified in seven principal groups. The groups range from A–1, consisting of gravelly soils of high bearing capacity, to A–7, consisting mostly of clay that has low strength when wet. The soils in group A–1 are mixtures of evenly graded coarse to fine material and nonplastic binder material. In group A–7 the volume of the material changes greatly when the moisture content changes. Within each group the relative engineering value of the soil material may be indicated by a group index. These group indexes range from 0 for the best material to 20 for the poorest.

Some engineers prefer the Unified classification system, which was established by the Waterways Experiment Station, Corps of Engineers (*17*). In this system soil material is identified as coarse grained (eight classes), fine grained (six classes), or highly organic (one class). An approximate classification of soils by

TABLE 4.—*Engineering test data for*

[Tests performed by the Pennsylvania Department of Highways in accordance with

Soil name and location	Parent material	Pennsylvania report No.	Depth	Horizon	Moisture-density [1] Maximum dry density	Moisture-density [1] Optimum moisture
			Inches		*Lb. per cu. ft.*	*Percent*
Alvira silt loam:						
0.75 mile southwest of Rohrsburg (modal profile).	Pre-Wisconsin glacial till.	BE-27788 BE-27789	22-32 51-60	B23gm C	112 112	16 15
1.5 miles southwest of Jerseytown on township road T-537 and 1 mile southeast of State Route 254 (shallower than modal profile).	Pre-Wisconsin glacial till.	BF-33640 BF-33641	20-28 32-40	B23g C1g	107 111	19 16
1.5 miles south of Waller (coarser textured than modal profile).	Pre-Wisconsin glacial till.	BH-38426 BH-38427	8-25 25-34	B2 C1	98 116	22 15
Chenango gravelly sandy loam:						
3 miles east of Bloomsburg and 300 feet north of U.S. Highway No. 11 (very gravelly profile).	Wisconsin glacial outwash.	BE-24282 BE-24283	10-16 21-48	B2 C	124 128	10 9
Gravel pit behind Mifflinville firehall (finer textured than very gravelly profile).	Wisconsin glacial outwash.	BF-25932 BF-25933	14-22 32-60	B22 C2	131 [5] 124	9 [5] 13
2 miles east of Mifflinville (coarse-textured profile).	Wisconsin glacial outwash.	BF-25934 BF-25935	6-23 23-60	B2 C	126 130	10 10
Hartleton channery silt loam:						
1 mile north of State Route 254 and 675 feet east of Rural Route 19063 (modal profile).	Pre-Wisconsin glacial till.	BE-24276 BE-24277	20-28 34-40	B22 C1	119 119	13 13
1.5 miles northeast of Rohrsburg (finer textured than modal profile).	Pre-Wisconsin glacial till.	BF-29882 BF-29883	16-23 27-34	B22 C	113 116	16 14
2 miles southeast of Bloomsburg (coarser textured than modal profile).	Pre-Wisconsin glacial till.	BF-25938 BF-25939	18-26 26-33	B22 C	118 118	13 13
Lackawanna channery loam:						
0.65 mile east of State Route 539 and 150 feet south of State Route 118 (modal profile).	Wisconsin glacial till.	BE-24278 BE-24279	24-32 50-54	B22 C	120 122	13 11
3 miles north of Waller on State Route 118 (finer textured than modal profile).	Wisconsin glacial till.	BH-38422 BH-38423	18-31 42-48	B22 C	113 114	17 16
4.5 miles north of Benton on township road T-810 (coarser textured than modal profile).	Wisconsin glacial till.	BH-38420 BH-38421	17-27 27-40	B22 C	122 126	11 10
Lawrenceville silt loam:						
1 mile east of Bloomsburg near southeast corner of radio station (modal profile).	Loess over pre-Wisconsin glacial till.	BE-24280 BE-24281	24-30 55-64	B22 C	117 116	13 11
1 mile west of Berwick (finer textured than modal profile).	Loess over pre-Wisconsin glacial till.	BF-25930 BF-25931	17-23 29-60	B22 IIC	114 115	14 15
0.5 mile west of Bloomsburg (profile with coarse-textured substrata).	Loess over pre-Wisconsin glacial till.	BF-25928 BF-25929	25-30 75-106	B22 C	110 120	13 13
Leck Kill channery silt loam:						
3 miles southwest of Catawissa on State Route 42 and 90 feet west of power pole No. 43 (modal profile).	Pre-Wisconsin glacial till.	BE-27792 BE-27793	15-24 29-37	B22 C	116 113	15 16
0.5 mile south of Catawissa (finer textured than modal profile).	Pre-Wisconsin glacial till.	BF-33642 BF-33643	24-35 70-80	B22 C	113 106	16 19
3 miles southwest of Catawissa (coarser textured than modal profile).	Pre-Wisconsin glacial till.	BF-25936 BF-25937	19-26 35-46	B22 C	116 115	15 16

See footnotes at end of table.

soil samples taken from 30 soil profiles
standard procedures of the American Association of State Highway Officials (AASHO) (*1*)]

Mechanical analyses [2]										Liquid limit	Plasticity index	Classification	
Percentage passing sieve—						Percentage smaller than—						AASHO [3]	Unified [4]
3-in.	¾-in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.				
100	99	91	86	81	74	71	54	30	21	29	7	A-4(8)	ML-CL.
------	------	100	99	99	98	96	73	36	22	28	4	A-4(8)	ML-CL.
------	------	------	------	100	99	99	90	66	50	40	17	A-6(11)	CL.
------	100	98	97	96	93	92	79	53	40	35	12	A-6(9)	ML-CL.
100	81	80	80	79	71	68	58	42	32	41	11	A 7-5(8)	ML.
100	72	61	56	50	40	37	30	20	15	29	7	A-4(1)	GM-GC.
100	63	49	44	36	23	20	12	8	5	21	1	A-1-b(0)	GM.
100	36	19	15	9	6	5	4	3	2	24	5	A-1-a(0)	GP-GC.
100	70	48	41	26	14	12	9	7	5	20	3	A-1-a(0)	GM.
100	62	37	31	8	4	3	3	2	2	17	0	A-1-a(0)	GP.
100	47	27	19	16	11	10	6	3	2	23	4	A-1-a(0)	GP-GC.
100	74	48	33	21	11	10	6	3	2	18	1	A-1-a(0)	GP-GM.
100	75	65	61	56	48	45	29	18	15	24	7	A-4(3)	GM-GC.
100	73	57	53	48	40	37	25	14	11	24	5	A-4(1)	GM-GC.
100	66	54	50	45	40	38	28	15	13	29	7	A-4(1)	GM-GC.
100	65	49	43	36	31	29	22	13	9	28	6	A-2-4(0)	GM-GC.
100	89	66	57	47	44	42	28	14	10	27	5	A-4(2)	GM-GC.
100	91	66	55	43	39	37	25	13	10	27	6	A-4(1)	GM-GC.
100	92	86	83	75	50	47	37	27	21	31	11	A-6(3)	SC.
100	81	76	72	64	42	39	29	20	16	29	9	A-4(1)	SC.
100	91	86	84	78	55	52	43	32	28	34	14	A-6(6)	CL.
100	96	90	87	81	59	56	46	33	26	31	8	A-4(5)	ML-CL.
100	76	63	58	46	33	31	22	12	8	20	2	A-2-4(0)	GM.
100	85	63	55	43	27	25	17	10	6	17	1	A-2-4(0)	GM.
100	98	97	97	96	73	60	33	13	10	24	2	A-4(8)	ML.
------	100	97	97	95	67	56	35	15	11	22	3	A-4(6)	ML.
------	100	99	98	97	91	84	50	24	18	27	4	A-4(8)	ML-CL.
100	96	90	87	80	69	65	47	31	25	27	0	A-4(7)	ML.
------	------	------	100	99	79	68	36	12	9	22	1	A-4(8)	ML.
100	80	71	61	42	24	22	17	11	8	24	5	A-1-b(0)	SM-SC.
100	85	77	73	70	50	46	35	25	20	29	9	A-4(3)	SC.
100	85	61	51	38	29	27	21	16	14	42	14	A-2-7(1)	GM.
100	89	85	82	81	71	68	54	36	31	37	17	A-6(10)	CL.
100	93	92	91	89	78	76	65	47	43	42	17	A-7-6(11)	ML-CL
100	71	48	44	35	31	29	21	15	12	31	8	A-2-4(0)	GM-GC.
100	78	56	49	36	29	27	21	14	11	31	8	A-2-4(0)	GM-GC.

TABLE 4.—*Engineering test data for soil*

Soil name and location	Parent material	Pennsylvania report No.	Depth	Horizon	Moisture-density [1]	
					Maximum dry density	Optimum moisture
			Inches		*Lb. per cu. ft.*	*Percent*
Shelmadine silt loam:						
2 miles southwest of Rohrsburg (modal profile).	Pre-Wisconsin glacial till.	BE-24274 BE-24275	22–32 42–50	B23g C	106 116	20 14
1 mile south of Jerseytown (finer textured than modal profile).	Pre-Wisconsin glacial till.	BF-33648 BF-33649	17–28 38–52	B22g BCg	115 115	15 15
6 miles north of Rohrsburg on township road T-701 (coarser textured than modal profile).	Pre-Wisconsin glacial till.	BH-38424 BH-38425	8–25 25–32	B2 C	101 114	22 14
Watson silt loam:						
1.75 miles west of Millville and 750 feet east of Rural Route 19050 (modal profile).	Pre-Wisconsin glacial till.	BE-27786 BE-27787	22–29 55–66	B23g C	111 113	16 15
2 miles southwest of Millville (finer textured than modal profile).	Pre-Wisconsin glacial till.	BF-33650 BF-33651	20–30 38–52	B22 C	116 116	14 14
4 miles northwest of Bloomsburg (coarser textured than modal profile).	Pre-Wisconsin glacial till over shale.	BF-33652 BF-33653	15–20 29–38	B22 C	114 120	16 14
Greenwood Township, B. E. Thomas farm (modal profile).	Pre-Wisconsin glacial till.	BE-27790 BE-27791	24–35 52–60	B23 C	114 114	15 14
1.5 miles south of Jerseytown (finer textured than modal profile).	Pre-Wisconisn glacial till.	BF-33646 BF-33647	27–37 57–66	B23g C	104 116	20 15
1 mile southwest of Buckhorn (coarser textured than modal profile).	Pre-Wisconsin glacial till.	BF-33644 BF-33645	28–35 45–72	B22 C	111 116	14 13
Wellsboro channery silt loam:						
Sugarloaf Township, Mountain View farm (modal profile).	Wisconsin glacial till.	BF-34129 BF-34130	22–31 52–63	B21 C	126 126	10 10
6 miles north of Benton (finer textured than modal profile).	Wisconsin glacial till.	BF-34131 BF-34132	20–28 33–46	B2 C	106 129	18 10
6 miles north of Benton on township road T-812 (coarser textured than modal profile).	Wisconsin glacial till.	BH-38418 BH-38419	13–19 23–36	B21 C	121 123	12 11

[1] Based on AASHO Designation T 99–57, The Moisture-Density Relations of Soils, Method A (*1*).
[2] According to the AASHO Designation T 88–57 (*1*). Results by this procedure frequently may differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analyses data used in this table are not suitable for use in naming textural classes for soils.

this system can be made in the field. Estimated classifications of major horizons of selected soils in Columbia County under both systems are given in table 4.

Soil test data

After soil material has been tested and its behavior observed when it is used in engineering structures, the engineer can develop design recommendations for the soil units delineated on the soil map. Samples that represent 9 soil series taken at 30 locations in Columbia County were tested by the Pennsylvania Department of Highways according to standard AASHO procedures. The data obtained from these tests and the AASHO and Unified classifications of each sample are given in table 4.

The test data given in table 4 were obtained by mechanical analyses and by testing the soils to determine the liquid limit and plastic limit.

The tests for the liquid limit and plastic limit measure the effect of water on the consistence of the soil material. As the moisture content of a clayey soil increases from a very dry state, the material changes from a semisolid to a plastic state. As the moisture content is further increased, the material changes from a plastic to a liquid state. The plastic limit is the moisture content at which the soil material passes from a

samples taken from 30 soil profiles—Continued

Mechanical analyses [2]										Liquid limit	Plasticity index	Classification	
Percentage passing sieve—						Percentage smaller than—						AASHO [3]	Unified [4]
3-in.	¾-in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.				
------	------	------	------	------	100	99	76	49	38	38	14	A-6(10)	ML-CL.
100	92	85	80	76	70	68	44	25	17	25	5	A-4(7)	ML-CL.
100	92	82	75	68	63	61	46	28	22	34	12	A-6(6)	ML-CL.
110	99	95	91	86	81	80	66	42	32	31	10	A-4(8)	ML-CL.
100	96	90	88	85	75	72	61	42	32	40	12	A-6(9)	ML.
100	82	72	68	61	49	46	37	24	18	30	7	A-4(3)	GM-GC.
100	97	95	93	89	85	83	65	38	27	33	8	A-4(8)	ML-CL.
100	64	46	38	34	31	29	22	12	10	33	6	A-2-4(0)	GM.
100	91	81	74	68	64	63	48	27	20	31	9	A-4(6)	ML-CL.
100	87	62	55	48	45	44	35	22	16	30	10	A-4(2)	GC.
------	100	79	65	53	50	49	43	26	18	33	7	A-4(3)	SM.
100	90	46	35	26	23	22	18	13	9	31	8	A-2-4(0)	GM-GC.
100	73	68	65	61	53	50	34	20	16	27	7	A-4(4)	ML-CL.
100	65	54	50	45	38	36	23	14	12	32	9	A-4(1)	GM-GC.
100	98	92	90	88	86	85	72	45	35	41	14	A-7 6(10)	ML-CL.
100	95	70	56	42	38	37	30	20	15	36	11	A-6(1)	SM-SC.
------	100	99	97	95	88	82	58	29	23	28	5	A-4(8)	ML-CL.
------	100	99	98	97	92	85	55	30	22	26	5	A-4(8)	ML-CL.
100	91	83	79	72	45	39	28	16	12	19	3	A-4(2)	SM.
100	94	85	80	70	45	41	31	20	16	21	6	A-4(2)	SM-SC.
------	------	------	------	100	93	89	75	46	34	41	14	A-7-6(10)	ML-CL.
100	99	91	76	60	51	48	28	16	13	28	8	A-4(3)	CL.
100	89	79	76	68	40	36	29	17	14	23	4	A-4(1)	SM-SC.
100	93	76	71	61	38	35	26	17	12	20	3	A-4(1)	SM.

[3] Based on AASHO Designation M 145-49 (*1*).
[4] Based on the Unified Soil Classification System, Tech. Memo. No. 3-357 v. 1, Corps of Engineers (*17*). SCS and BPR have agreed to consider that all soils having plasticity indexes within two points of the A-line are to be given a borderline classification. An example of a borderline classification obtained by this use is ML-CL.
[5] Test discontinued because material was too wet.

semisolid to a plastic state. The liquid limit is the moisture content at which the soil material passes from a plastic to a liquid state. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is in a plastic condition.

Table 4 also gives compaction (moisture-density) data for the tested soils. If a soil material is compacted at a successively higher moisture content, assuming that the compactive effort remains constant, the density of the compacted material increases until the optimum moisture content is reached. After that, the density decreases with increase in moisture content. The highest dry density obtained in the compaction test is called maximum dry density. Data showing moisture density are important in earthwork, for, as a rule, optimum stability is obtained if the soil is compacted to about the maximum density when it is at approximately the optimum moisture content.

Soil properties and engineering interpretations

The properties of the soils and the interpretations most significant to engineers are given in tables 5 and 6. Soil scientists and engineers prepared these tables by using the test data of table 4, information from other parts of the report, and their knowledge of other soils that are similar to the soils in this county.

Table 5 gives estimates of important physical properties that affect engineering work on the soils in Columbia County. More information that is useful to engi-

TABLE 5.—*Physical*

[Absence of data indicates

Soil and map symbol	Depth to seasonally high water table	Depth to bedrock	Depth from surface (typical profile)	Coarse fraction greater than 3 inches	Percentage passing sieve— No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)
	Feet	*Feet*	*Inches*	*Percent*				
Albrights (AaA, AaB2, AaC)	1½	4–8	0–5					
			5–32	0	80–95	80–90	70–80	65–90
			32–40	15	80–90	70–80	70–80	60–75
Allenwood (AeA, AeB2, AeC2)	3+	4–30	0–8					
			8–18	0	85–95	75–85	70–80	65–75
			18–60	5	85–95	75–85	75–85	70–80
Allis (AnB2)	0	1½–3½	0–6	0				
			6–40	0	90–100	80–90	70–90	60–90
Alvira (ArA, ArB, AsB2, AsC2)	0	4–8	0–10					
			10–22	0	80–100	80–100	80–90	80–90
			22–51	5	80–100	80–100	80–90	70–85
			51–60	20	75–90	70–85	70–80	60–80
Atherton (At)	0	5–15	0–12					
			12–28	0	65–85	60–80	60–65	55–65
			28–33	0	50–70	40–50	35–45	20–35
Barbour:								
Fine sandy loam and gravelly loam (Ba, Bb)	3+	6–15	0–11					
			11–17	5	90–100	80–100	80–95	40–50
			17–40	20	30–40	25–35	20–30	10–20
Silt loam (Bc)	3+	6–15	0–11	0				
			11–17	5	95–100	90–100	85–100	65–100
			17–40	20	30–40	25–35	20–30	10–20
Basher (Bd)	2	4–15	0–9					
			9–23	0	90–100	80–100	70–80	60–75
			23–36	0	80–100	70–90	60–80	30–40
Belmont (BeB2, BeC2)	3+	4–8	0–6					
			6–36	0	95–100	80–100	80–95	70–90
			36–42	0	70–95	70–90	65–85	60–80
Berks (BkB2, BkC2)	3+	1–2	0–8					
			8–15	0	50–60	35–50	30–45	25–40
			15–30	10	35–50	25–40	15–25	10–15
Braceville (BrA, BrB)	1½	10–100	0–16					
			16–34	5	70–90	60–80	50–70	40–50
			34–60	20	25–50	20–35	15–30	10–20
Buchanan (BuB, BvB)	1½	4–30	0–10					
			10–36	20	80–90	75–85	60–70	45–60
			36–95	40	75–90	65–80	50–65	40–55
Calvin (CaB2, CaC2, CbD2, CbE2) (For properties of the Klinesville soil in mapping units CbD2 and CbE2, refer to the Klinesville soil series in this table.)	3+	1–3	0–8					
			8–13	0	35–60	25–50	20–45	15–40
			13–20	0	30–50	25–40	15–25	10–15
Canfield (CfB2)	1½	4–20	0–8					
			8–33	10	65–75	55–70	50–65	40–55
			33–50	30	60–80	50–75	55–65	25–55
Chenango:								
Gravelly sandy loam (CgA, CgB2, CgC2, CgD3).	3+	10–100	0–10					
			10–21	20	30–70	20–60	15–40	10–20
			21–48	35	20–70	15–40	10–25	5–20
Silt loam (ChA, ChB2)	3+	10–100	0–10					
			10–21	20	70–90	60–80	40–60	20–40
			21–48	35	60–80	50–70	40–60	10–25

See footnote at end of table.

properties of the soils

estimate was not made]

Engineering classification: Unified	Engineering classification: AASHO	Permeability	Available moisture capacity	Reaction	Optimum moisture for compaction	Maximum dry density	Shrink-swell potential	Corrosion potential for steel
		Inches per hour	*Inches per inch*	*pH*	*Percent*	*Pounds per cubic foot*		
		2.0-6.2	0.21	5.8				High.
ML-CL	A-4	0.62-2.0	.18	5.6	13	118	Medium	High.
ML, ML-CL	A-4	0.2-0.62	.12	5.2	10	122	Medium	High.
		2.0-6.2	.24	5.0				Low.
ML	A-4	0.62-2.0	.17	5.0	14	114	Low	Low.
ML	A-4	0.62-2.0	.15	5.0	15	112	Low	Low.
		2.0-6.2	.22	5.1				High.
ML, CL, CH	A-4, A-7	0.2-0.62	.08	5.2	14	114	Medium	High.
		0.62-2.0	.21	5.8				High.
ML	A-4, A-6	0.2-0.62	0.13-0.17	5.6	18	106	Low	High.
ML-CL	A-4, A-6	0.2-0.62	.08	5.0	18	106	Low	High.
ML-CL	A-4, A-6	<0.2	.08	5.0	15	112	Low	High.
		0.62-2.0	.18	5.2				High.
ML-CL	A-4	0.2-0.62	.15	5.0	12	110	Medium	High.
GM, SM	A-2	<0.62	.15	5.0	11	112	Low	High.
		>6.2	.15	5.5				Low.
SM	A-4	>6.2	.10	5.5	14	114	Low	Low.
GP, GM	A-2	>6.2	.12	5.6	12	124	Low	Low.
		>6.2	.20	5.5				Low.
ML-CL	A-4	>6.2	.15	5.5	14	114	Low	Low.
GP, GM	A-2	>6.2	.12	5.6	12	124	Low	Low.
		>6.2	.20	5.5				Moderate.
ML	A-4	>6.2	.15	5.5	17	110	Low	Moderate.
SM	A-2 or A-4	0.62-2.0	.10	5.6	14	116	Low	Moderate.
		2.0-6.2	.21	6.2				Moderate.
ML	A-7	0.62-2.0	.18	5.8	15	116	Medium	Moderate.
ML	A-4	0.62-2.0	.18	5.8	15	116	Medium	Moderate.
		2.0-6.3	.17	5.8				Low.
GM-GC	A-2, A-4	2.0-6.3	.15	5.2	16	112	Low	Low.
GM	A-2	2.0-6.3+	.10	5.2	14	115	Low	Low.
		2.0-6.3	.15	6.3				Moderate.
SM	A-4	0.2-0.63	.15	5.6	14	115	Low	Moderate.
GM	A-1	2.0-6.3+	.12	5.6	10	120	Low	Moderate.
		2.0-6.2	.21	5.2				Moderate.
SM, ML-CL	A-4	0.63-2.0	.15	5.2	14	114	Low	Moderate.
SM, ML-CL	A-4	0.2-0.63	.10	5.4	14	116	Low	Moderate.
		2.0-6.3	.18	5.9				Low.
ML, SM, GM	A-4 or A-2	2.0-6.3	.16	6.0	15	116	Low	Low.
GM	A-2	2.0-6.3	.10	6.3	13	119	Low	Low.
		2.0-6.3	.20	5.6				Moderate.
SM, ML-CL	A-4	0.63-2.0	.15	5.0	16	110	Low	Moderate.
ML-CL, GM-GC	A-4 or A-2	0.2-0.63	.08	5.0	12	124	Low	Moderate.
		>6.3	.12	5.4				Low.
GM, SM	A-1, A-2	>6.3	.10	5.4	10	127	Low	Low.
GM, GP	A-1	>6.3	.04	5.8	9	129	Low	Low.
		>6.3	.18	5.4				Low.
SM	A-2, A-4	2.0-6.3	.10	5.4	14	118	Low	Low.
GM, SM	A-1, A-2	>6.3	.04	5.8	9	128	Low	Low.

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TABLE 5.—*Physical properties*

Soil and map symbol	Depth to seasonally high water table	Depth to bedrock	Depth from surface (typical profile)	Coarse fraction greater than 3 inches	Percentage passing sieve—			
					No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)
	Feet	*Feet*	*Inches*	*Percent*				
Dekalb (DaB2, DaC2, DkB, DkD, DkF)	3+	2–4						
			0–9	15–20	55–75	50–65	35–55	20–35
			9–36	25–40	50–60	45–55	35–45	20–30
Duncannon (LgB, LgC2) (For properties of Duncannon soil and of Lawrenceville soil in mapping units LgB and LgC2, refer to the Lawrenceville soil series in this table.)								
Edgemont (EdB, EdD)	3+	1–15	0–12					
			12–27	30	60–80	50–70	45–65	20–30
			27–38	60	50–65	45–55	40–55	10–25
Hartleton (HhA, HhB2, HhC2, HhC3, HhD2, HhD3, HrB, HrD).	3+	2–3	0–8					
			8–28	10	50–65	50–65	45–60	40–50
			28–34	20	50–65	40–55	40–50	30–40
Holly silt loam (Hs)	0	4–30	0–10					
			10–30	0	65–85	60–85	60–85	55–65
			30–40	0	50–85	45–80	45–80	15–35
Klinesville (KaB2, KaC2, KaC3, KaD2, KaD3, KkE, KlB, KlD, KlF). (For properties of Leck Kill soil in mapping units KkE, KlB, KlD, KlF, refer to Leck Kill channery silt loam in this table.)	3+	1–2	0–10					
			10–14	35	25–40	20–30	10–25	10–15
Lackawanna (LaB2, LaC2, LaD2, LcB, LcD, LdF). (For properties of Oquaga soil in mapping unit LdF, see Oquaga very stony silt loam in this table.)	3+	4–8	0–12					
			12–45	10–20	75–90	70–85	60–80	40–50
			45–54	15–30	60–80	55–80	45–80	30–55
Laidig (LeB2, LeC2, LfB, LfD)	3+	4–30	0–12					
			12–29	10–15	55–70	50–60	40–50	20–30
			29–41	20–35	50–65	40–50	35–45	20–20
Lawrenceville (LgB, LgC2)	2	6–20	0–14					
			14–55	0	90–100	90–100	85–100	75–90
			55–64	0	80–100	80–100	75–90	55–65
Leck Kill:								
Channery silt loam (LkA, LkB2, LkC2, LkC3, LkD2, LkD3).	3+	2–3	0–8					
			8–23	5	55–80	50–80	40–80	35–70
			23–32	25	60–85	50–85	35–85	25–75
Channery silt loam, deep (LlA, LlB2, LlC2, LlC3). Very stony silt loam, deep (LmB, LmD, LmE).	3+	4–20	0–8					
			8–38	5–10	85–95	75–85	75–85	65–75
			38–46	10–20	85–95	75–85	75–85	70–80
Lickdale (Ln, Lo)	0	6–12	0–7					
			7–18	0–20	75–90	70–80	70–80	55–70
			18–40	10	70–85	60–75	60–70	55–65
Litz (LpB2, LpC2, LrC3, LrD3, LrE2) (For properties of Weikert soil in mapping units LrC3, LrD3, and LrE2, refer to the Weikert soil series in this table.)	3+	1–2	0–5					
			5–15	0	55–70	45–60	40–55	25–40
			15–25	0	45–60	35–50	30–45	20–30
Lordstown (LsB2, LsC2, LsD2, LtB, LtD, LtF)	3+	1½–2½	0–9					
			9–22	10–20	40–50	30–40	15–25	10–25
Middlebury (Mb, Md)	2+	4–15	0–9					
			9–30	0	65–90	65–85	60–80	40–65
			30	0	45–80	50–70	50–70	30–40

See footnote at end of table.

of the soils—Continued

Engineering classification		Permeability	Available moisture capacity	Reaction	Optimum moisture for compaction	Maximum dry density	Shrink-swell potential	Corrosion potential for steel
Unified	AASHO							
		Inches per hour	*Inches per inch*	*pH*	*Percent*	*Pounds per cubic foot*		
GM	A-2	2.0-6.3	0.10-0.14	5.2	14	108	Low	Low.
GM	A-2	>6.3	0.08-0.10	5.2	11	120	Low	Low.
		>6.3	.14	5.2				Low.
SM	A-2	2.0-6.3	.12	5.2	12	120	Low	Moderate.
GM, SM	A-2	2.0-6.3	.10	5.2	10	123	Low	Moderate.
		2.0-6.3	.17	5.8				Low.
GC-GM	A-4	2.0-6.3	.15	5.6	14	118	Low	Low.
GC-GM	A-2, A-4	2.0-6.3	.15	5.4	13	118	Low	Low.
		2.0-6.3	.17	5.2				High.
ML	A-4	0.63-2.0	.16	5.2	16	109	Medium	High.
SM	A-2	2.0-6.3	.11	5.4	10	120	Low	High.
		2.0-6.3	.15	6.1				Low.
GM-GC	A-1, A-2	2.0-6.3	.12	5.6	12	118	Low	Low.
		2.0-6.3	.16	7.0				Low.
SC, GM	A-6, A-4	0.63-2.0	.10	5.2	13	118	Low	Low.
SC, GM, ML-CL	A-4, A-2	0.63-2.0	.08	5.0	12	121	Low	Low.
		2.0-6.3	.21	5.2				Low.
SM, GM	A-1	0.63-2.0	.17	5.4	12	119	Low	Low.
SM, GM	A-2	0.20-0.63	.12	5.4	13	118	Low	Low.
		2.0-6.3	.21	5.6				Moderate.
ML	A-4	0.63-2.0	.17	5.6	13	113	Low	Moderate.
ML	A-4	0.63-2.0	.17	5.8	13	114	Low	Moderate.
		2.0-6.3	.17	6.8				Low.
SC, CL, GM-GC	A-6	0.63-2.0	.15	7.2	15	115	Low	Low.
GM-GC, ML-CL	A-2, A-4	0.63-2.0	.15	5.9	17	111	Low	Low.
		2.0-6.3	.20	5.8				Low.
ML	A-4	0.62-2.0	.17	5.4	14	114	Low	Low.
ML	A-4	0.62-2.0	.15	5.4	15	112	Low	Low.
		2.0-6.3	.18	5.0				High.
ML-CL	A-4	<0.2	.18	5.0	22	107	Medium	High.
ML-CL	A-4	0.2-0.63	.12	5.4	18	115	Medium	High.
		2.0-6.3	.17	5.8				Low.
GM-GC	A-2, A-4	2.0-6.3	.15	5.6	16	112	Low	Low.
GM	A-2	2.0-6.3	.12	5.6	16	115	Low	Low.
		2.0-6.3	.15	5.6				Low.
GM	A-2	2.0-6.3	.12	5.6	12	120	Low	Low.
		>6.3	.15	5.5				Moderate.
SM or ML	A-4	0.63-2.0	.15	5.4	14	110	Low or medium.	Moderate.
SM	A-2, A-4	2.0-6.3+	.10	5.4	12	116	Low	Moderate.

TABLE 5.—*Physical properties*

Soil and map symbol	Depth to seasonally high water table	Depth to bedrock	Depth from surface (typical profile)	Coarse fraction greater than 3 inches	Percentage passing sieve— No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)
	Feet	*Feet*	*Inches*	*Percent*				
Morris (MrB, MsB)	0	3-6	0-5					
			5-18	0	70-80	60-70	55-65	40-55
			18-38	20	75-85	65-75	60-75	40-60
Oquaga:								
Channery silt loam (OcB2, OcC2, OcD2)	3+	1½-2½	0-7					
			7-19	5	65-80	50-70	40-55	30-45
			[1] 19-22	0	45-65	40-55	15-25	10-25
Very stony silt loam (OsB, OsD)	3+	1½-2½	0-7					
			7-19	10	35-45	25-40	20-35	15-25
			19-22	10	25-35	15-25	15-20	5-15
Papakating (Pa)	0	4-10	0-10					
			10-40	0	95-100	95-100	90-100	90-100
Pekin (PkA, PkB2)	2	3-30	0-17					
			17-40	20	40-60	30-50	25-35	20-30
			40-60	40	30-40	25-35	15-30	5-15
Ravenna (RaA, RaB)	0	3-6	0-8					
			8-29	0	70-85	55-65	55-60	45-55
			29-42	0	65-75	55-70	55-65	45-55
Shelmadine (SdA, SdB2, Sh)	1+	4-12	0-8					
			8-42	0-10	85-100	75-100	70-100	70-100
			42-50	0-5	70-95	65-90	60-85	55-75
Tioga:								
Fine sandy loam (Tf)	3+	6-15	0-4					
			4-20	0	75-100	90-100	60-90	40-60
			20-60	0	50-75	40-60	30-50	10-30
Gravelly loam (Tg)	3+	6-15	0-4					
			4-20	0	80-100	80-100	60-90	40-50
			20-60	0	30-40	25-35	25-35	10-20
Silt loam (Ts); Silt loam, high bottom phase (Tt)	3+	6-15	0-4					
			4-20	0	65-90	60-80	50-75	40-60
			20-60	0	50-75	45-60	40-50	20-45
Washington (WaA, WaB2, WaC2)	3+	3-6	0 13					
			13-47	5	80-100	80-100	80 95	70-90
			47-60	15	85-95	80-90	80-90	75-90
Watson (WbA, WbB2, WbC2)	2+	4-7	0-8					
			8 43	10	65-100	65-95	60-95	50-90
			43-60	15	55-100	50-100	40-95	35-90
Weikert (WcB2, WcC2, WcD2, WcF2, WeD, WeF).	3+	1-5	0-8					
			8-20	10-35	35-55	25-45	15-40	10-30
			20-30	20-70	25-35	15-45	10-25	5-15
Wellsboro (WfB2, WfC2, WhB)	1½	4-8	0-7					
			7-31	5-10	70-90	70-80	60-75	45-65
			31-62	10-25	80 90	70-80	60-75	30-50
Westmoreland (WmB2, WmC2)	3+	3-6	0-9					
			9-38	5-15	85-100	80-100	75-95	65-85
			38-50	5-15	25-55	20-45	15-40	15-35

See footnote at end of table.

of the soils—Continued

Engineering classification		Permeability	Available moisture capacity	Reaction	Optimum moisture for compaction	Maximum dry density	Shrink-swell potential	Corrosion potential for steel
Unified	AASHO							
		Inches per hour	*Inches per inch*	*pH*	*Percent*	*Pounds per cubic foot*		
		2.0-6.3	0.21	5.2				High.
SC or CL	A-4	0.63-2.0	.20	4.8	13	118	Low	High.
CL-ML or SM	A-4	<0.20	.14	5.0	10	122	Low	High.
		2.0-6.3	.15	5.6				Moderate.
SM, SC	A-2 or A-4	2.0-6.3	.13	5.4	15	112	Low	Low.
GM, GC	A-2	2.0-6.3	.10	5.2	10	120	Low	Low.
		2.0-6.3	.15	5.6				Low.
GM-GC	A-2	2.0-6.3	.10	5.4	15	112	Low	Low.
GW, GM-GC	A-1	2.0-6.3	.10	5.2	14	115	Low	Low.
		2.0-6.3	.20	5.4			Medium	High.
ML	A-4	0.63-2.0	.10	5.4	15	105	Medium	High.
		2.0-6.3	.15	6.2				Moderate.
GM-SM	A-1	0.2-0.63	.15	5.6	10	120	Low	Moderate.
GM, GP	A-1	>6.3	.04	5.4	9	128	Low	Moderate.
		2.0-6.3	.21	5.0				High.
ML-CL or SM	A-4	0.2-0.63	.12	4.8	13	116	Low	High.
ML-CL or SM	A-4	>0.20	.10	4.8	10	121	Low	High.
		0.63-2.0	.20	5.2			Medium	High.
CL-ML	A-6	0.2-0.63	.16	5.0	19	107	Medium	Moderate.
CL-ML	A-4	>0.2	.13	5.0	14	115	Medium	Moderate.
		>6.3	.10	5.5				Low.
SM, SC	A-4	>6.3	.15	5.5	14	114	Low	Low.
SM, SC	A-1, A-2	>6.3	.12	5.5	12	120	Low	Low.
		>6.3	.17	5.5				Low.
SM	A-4	>6.3	.15	5.5	14	114	Low	Low.
GP	A-1	>6.3	.12	5.5	12	124	Low	Low.
		>6.3	.20	5.5				Low.
SM, SC, ML	A-4	2.0-6.3	.15	5.5	14	114	Low	Moderate.
SM, SC, GM	A-1, A-2, or A-4.	2.0-6.3	.12	5.5	12	120	Low	Low.
		2.0-6.3	.21	6.2				Moderate.
ML	A-4, A-6	0.63-2.0	.18	5.5	17	109	Medium	Moderate.
ML	A-4, A-7	0.63-2.0	.17	5.5	16	105	Medium	Moderate.
		2.0-6.3	.20	5.8				Moderate.
ML-CL	A-4	0.63-2.0	.17	5.2	16	110	Medium	Moderate.
CL-ML, SM, GM	A-4, A-6	0.20-0.63	.12	5.2	15	115	Medium	Moderate.
		2.0-6.3	.14	5.4				Low.
GM-GC	A-2	2.0-6.3	.10	5.0	15	113	Low	Low.
GW, GM-GC	A-1	2.0-6.3	.10	5.0	14	116	Low	Low.
		2.0-6.3	.22	6.0				Moderate.
ML-CL, SC	A-4	0.63-2.0	.20	5.8	13	118	Medium	Moderate.
SM-SC	A-2 or A-4	0.63-2.0	.11	5.4	10	126	Medium	Moderate.
		2.0-6.3	.20	6.6				High.
CL-ML	A-4	0.2-0.63	.15	5.8	13	112	Medium	High.
GC	A-2	0.63-2.0	.10	5.8	12	112	Low	Moderate.

TABLE 5.—*Physical properties*

Soil and map symbol	Depth to seasonally high water table	Depth to bedrock	Depth from surface (typical profile)	Coarse fraction greater than 3 inches	Percentage passing sieve—			
					No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)
	Feet	*Feet*	*Inches*	*Percent*				
Wiltshire (WnA, WnB2, WnC2)	1½	3–12	0–8					
			8–28	0	95–100	95–100	95–100	80–95
			28–45	0	95–100	95–100	95–100	75–90
Wooster (WoB2, WoC2, WoD2, WpD, WsB) (For properties of the Canfield soil in mapping unit WsB, refer to the Canfield soil series in this table.)	3+	4–8	0–10					
			10–40	15	75–90	70–85	60–80	35–50
			40–62	15	70–80	65–75	50–70	40–50
Zipp (Zp)	0	4–10	0–8					
			8–40	0	90–100	85–95	85–90	75–90
			40–48	0	85–100	75–90	70–85	65–80

[1] Red shale and sandstone occur at a depth of about 22 inches.

neers can be found in the sections "Descriptions of the Soils" and "Formation and Classification of the Soils." Not included in table 5 are the land types Made land, Mine dumps, Mucky peat, Riverwash, Steep very stony land, and Strip mine spoil.

The depth to a seasonally high water table and to bedrock are indicated in table 5. Depth to bedrock is important to the engineer because it may greatly affect the cost of excavating and the design of foundations. Soils that have a high water table are limited in their use for highways and other construction.

For the uppermost layer of each soil, grain-size fractions and engineering classification are not given, because the material in this layer generally is not suitable for use in most engineering structures.

Other properties estimated in table 5 are permeability, reaction, optimum moisture for compaction, shrink-swell potential, and corrosion potential. Permeability is the property of a soil that permits water to flow through it. Optimum moisture content is the percentage of moisture at which the maximum density of a soil is obtained under given compaction. This percentage is estimated on the basis of the dry weight of the soil. Shrink-swell potential indicates the change in volume to be expected in a soil material as its content of moisture changes. The corrosion potential of a soil indicates how susceptible to corrosion steel pipes are if they are laid in the soil.

Table 6 rates the soils of the county according to susceptibility to frost action, suitability for winter grading, and suitability as sources of topsoil, sand, gravel, and road fill. It also names the soil features that adversely affect engineering practices and structures and that therefore must be considered in planning practices and in designing, constructing, and maintaining structures. The interpretations are based on characteristics such as depth to a seasonally high water table and to bedrock and the texture, permeability, and stoniness of the soils.

Frost action can cause volume changes which may result in the deterioration of pavements and other structures. Because of seepage along back slopes, the overlying material may slump. These conditions may make it necessary to relocate the highway. The installation of drainage systems may be needed to lower the water table or to remove excessive water that accumulates.

Factors to be considered when designing farm ponds and flood-retarding structures are (1) the need for and placement of toe drains, filter blankets, and cutoff trenches, (2) the slope of embankments, (3) the depth to bedrock, (4) the depth to the water table, and (5) the location of suitable borrow areas. Ponds and flood-retarding structures should be carefully designed if the soils are in group A–4 or A–6 in the AASHO system, or are in group ML or CL in the Unified system. Soils that developed on limestone may have caverns in the bedrock and be unsuitable for ponds. Moisture and density control are most essential when soil material is placed in embankments.

The erodibility and permeability of the soil material, the depth to the water table and the hardpan layer, and the steepness of slope are properties that should be considered when planning drainage and irrigation systems, diversions and waterways.

Use of Soils in Community Development

Beyond the limit of many cities and towns, homes are scattered in rural areas where there is some farming. This soil survey offers much information that is helpful in planning and developing these areas and in solving the problems that arise as land use changes. Planning officials, developers, and homeowners can find information about the soils on the maps and in the descriptions and tables in this report. In the subsection "Engineering Applications," tables list engineering properties of the soils and give interpretations of these properties. Table 5 in that subsection contains information that will be helpful in locating building sites and areas that are suitable for the disposal of sewage effluent. The permeability of the soil, depth to a seasonally high water table and to bedrock, and steepness of slope are properties that should be considered when selecting a site for the disposal of sewage effluent from septic tanks. Unstable

of the soils—Continued

Engineering classification		Permeability	Available moisture capacity	Reaction	Optimum moisture for compaction	Maximum dry density	Shrink-swell potential	Corrosion potential for steel
Unified	AASHO							
		Inches per hour	*Inches per inch*	*pH*	*Percent*	*Pounds per cubic foot*		
		2. 0-6. 3	0. 24	6. 3				Moderate.
CL-ML	A-4	0. 63-2. 0	. 18	5. 8	16	113	Medium	Moderate.
CL-ML	A-4	0. 2-0. 63	. 11	5. 5	15	118	Medium	Moderate.
		2. 0-6. 3	. 20	6. 6				Low.
GC, SC	A-4	0. 63-2. 0	. 17	5. 4	13	119	Low	Low.
SC	A-4	0. 63-2. 0	. 15	5. 2	12	120	Low	Low.
		2. 0-6. 3	. 21	5. 8				High.
CL-ML	A-7	0. 2-0. 63	. 17	6. 0	18	101	High	High.
CL-ML	A-7	0. 2-0. 63	. 15	6. 0	20	103	High	High.

soil material does not give solid support for foundations. Foundations and basements may be wet because the water table is high or because flooding is frequent.

In table 7 the soils of the county are rated *slight*, *moderate*, and *severe* according to their degree of limitation for community development, and the main limitation is given if the rating is moderate or severe. An estimated rating of severe does not mean that the soils cannot be used for the purpose listed, for a severe limitation may be overcome by suitable treatment of the soil.

In the text of this subsection, most of the soils of the county are placed in 11 building site groups according to properties that affect their use for community development. Because Made land, Mine dumps, Riverwash, Steep very stony land, and Strip mine spoil are variable, they have not been placed in a building site group. The properties described for the groups are depth, slope, internal drainage, flooding, seasonally high water table, kind of parent material, and stoniness. Also discussed is the effect of these properties on foundations for buildings, performance of septic tanks, and other aspects of community development. The groupings of the soils were made to give general guidance and are not intended to supplant investigations on the site.

The names of soil series represented are mentioned in the description of each building site group, but this does not mean that all the soils of a given series appear in the unit. To find the name of all the soils in any given building site group, refer to the "Guide to Mapping Units" at the back of this report.

BUILDING SITE GROUP 1

This group is made up of Allenwood, Belmont, Chenango, Lackawanna, Laidig, Leck Kill, Washington, Westmoreland, and Wooster soils. These soils are deep, well drained, and permeable, and they have slopes ranging from 0 to 12 percent. Some of them are moderately eroded, and some are channery.

The soils in this group have fewer natural limitations as building sites than other soils in the county. Also, they are some of the best soils in the county for farming and are the most easily cultivated. They are suitable as building sites because they have favorable slopes and can be graded easily. Also, they furnish good foundations. Filter fields for septic tanks are good because permeability is good and the water table is not seasonally high, but the ground water in the Chenango and Washington soils may be polluted because the effluent from septic tanks flows freely through the underlying material. The Chenango soils are underlain by gravel and coarse sand, and the Washington soils are underlain by limestone that has channels made by solution. All the soils in the unit have good moisture-holding capacity and are suitable for lawns, gardens, shrubs, and shade trees.

BUILDING SITE GROUP 2

The soils in this group are deep, well drained, and permeable. They have slopes ranging from 12 to 35 percent. These soils are in the Allenwood, Belmont, Chenango, Lackawanna, Laidig, Leck Kill, Washington, Westmoreland, and Wooster series. They are moderately eroded or severely eroded, and some of them are channery.

Most of the soils in this group have slopes that are satisfactory as sites for homes but are too steep for large commercial or industrial buildings. Problems of construction increase on slopes of more than 20 percent. These soils make good foundations except in steeper areas where there is some soil creep. In community development, surface runoff and gullies can be a serious problem.

These soils have good surface drainage and are free from a seasonally high water table. Permeability is sufficient for disposing normal loads of effluent from septic tanks, but heavy use of the Chenango or Washington soils is likely to contaminate the ground water. Under the Chenango soils, the liquid waste permeates the porous beds of gravel, and under the Washington soils the waste flows through the cracks in the limestone that were made by solution. The soils in this unit are suitable for trees, shrubs, and lawns, but there is danger of serious erosion while the vegetation is being established.

TABLE 6.—*Engineering*

Soil series, soil types, land types, and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of— Topsoil	Sand and gravel	Road fill	Soil features adversely affecting— Highway location
Albrights (AaA, AaB2, AaC)	Poor	Moderate	Good in surface layer.	Unsuitable	Fair	Seasonally high water table; frost heaving.
Allenwood (AeA, AeB2, AeC2)	Fair	Low	Good	Unsuitable	Fair	No undesirable features.
Allis (AnB2)	Poor	Moderate	Good in surface layer.	Unsuitable	Poor	High water table
Alvira (ArA, ArB, AsB2, AsC2)	Unsuitable	High	Fair	Unsuitable	Fair	Seasonally high water table; frost heaving.
Atherton (At)	Poor	High	Good in surface layer.	Poor	Fair	High water table
Barbour (Ba, Bb, Bc)	Fair	Moderate	Good	Fair	Good	Flooding
Basher (Bd)	Poor	High	Good	Unsuitable	Good	Flooding; seasonally high water table; frost heaving.
Belmont (BeB2, BeC2)	Good	Low	Good	Unsuitable	Fair	Slips
Berks (BkB2, BkC2)	Fair	Moderate	Fair	Unsuitable	Fair	Shallowness
Braceville (BrA, BrB)	Fair	Moderate	Good	Good	Good	Seasonally high water table.
Buchanan (BuB, BvB)	Poor	High	Fair	Unsuitable	Good	Seasonally high water table; frost heaving.
Calvin (CaB2, CaC2, CbD2, CbE2) (For properties of the Klinesville soil in mapping units (CbD2 and CbE2, refer to interpretations in this table for the Klinesville soil series.)	Fair	Moderate	Poor	Unsuitable	Fair	Shallow to shale
Canfield (CfB2)	Poor	High	Fair	Unsuitable	Fair	Seasonally high water table; frost heaving.
Chenango (CgA, CgB2, CgC2, CgD3, ChA, ChB2).	Good	Low	Fair in surface layer.	Good	Good	No undesirable features.
Dekalb (DaB2, DaC2, DkB, DkD, DkF)	Good	Low	Poor	Poor to unsuitable.	Good	Shallowness to bedrock.

interpretations of the soils

Soil features adversely affecting—Continued						
Construction and maintenance of pipelines	Farm ponds		Agricultural drainage	Irrigation	Terraces and diversions	Waterways
	Reservoir area	Dikes and embankments				
Fluctuating water table; high corrosivity (steel).	No undesirable features.	No undesirable features.	Moderately slow permeability.	Moderate moisture-holding capacity.	No undesirable features.	No undesirable features.
No undersirable features.	Moderate permeability.	No undesirable features.	Not needed	No undesirable features.	No undesirable features.	No undesirable features.
High water table; high corrosivity (steel).	Shallowness to shale.	Very little soil material.	Shallowness to shale; high water table.	Low moisture-holding capacity.	Shallowness	Shallowness; high water table.
Fluctuating water table.	No undesirable features.	No undesirable features.	Slow permeability.	Shallowness to pan.	Hardpan	Hardpan.
High water table; high corrosivity (steel).	Excessive seepage; underlying gravel.	Pervious substrata.	Lack of outlets	High water table.	High water table.	High water table; low gradient.
Flooding	Flooding; rapid permeability.	Flooding; rapid permeability; erodibility.	Not needed	Moderate moisture-holding capacity.	Flooding	Flooding; low gradient.
Flooding; fluctuating water table; moderate corrosivity (steel).	Flooding; underlain by gravel in some areas.	Flooding; erodibility.	Flooding; lack of outlets.	Moderate moisture-holding capacity.	Flooding	Flooding; low gradient.
No undesirable features.	Solution caverns	Moderate permeability.	Not needed	No undesirable features.	No undesirable features.	No undesirable features.
Shallowness	Shallowness to shaly bedrock.	Moderately rapid permeability.	Not needed	Shallowness; low moisture-holding capacity.	Shallowness	Shallowness to bedrock.
Fluctuating water table; moderate corrosivity (steel).	Excessive seepage; underlain by gravel.	Pervious substrata.	Moderately slow permeability.	Moderate moisture-holding capacity.	Seasonally high water table.	Seasonally high water table.
Fluctuating water table; moderate corrosivity (steel); some areas very stony.	No undesirable features.	Cobbles or stones.	Moderately slow permeability; fragipan; stoniness.	Moderately slow permeability.	Cobbles or stones.	Cobbles or stones.
Shallowness to bedrock.	Shallowness to shale.	Moderately rapid permeability.	Not needed	Moderate moisture-holding capacity.	Shallowness to bedrock.	Variable depth to shale.
Seasonally high water table.	No undesirable features.	No undesirable features.	Moderately slow permeability.	Moderately slow permeability.	No undesirable features.	Seasonally high water table.
No undesirable features.	Excessive seepage; underlain by gravel.	Rapid permeability; erodibility.	Not needed	Moderate moisture-holding capacity; very permeable substrata.	Rapid permeability.	Erodibility.
Shallowness to bedrock; some areas very stony.	Rapid permeability.	Rapid permeability; some areas very stony.	Not needed	Low moisture-holding capacity.	Shallowness to bedrock; some areas are very stony or steep.	Shallowness to bedrock; some areas very stony.

TABLE 6.—*Engineering interpretations*

Soil series, soil types, land types, and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of— Topsoil	Sand and gravel	Road fill	Soil features adversely affecting— Highway location
Duncannon (LgB, LgC2) (For properties of the Lawrenceville soil in mapping units LgB and LgC2, see interpretations in this table for the Lawrenceville soil series).	Poor	High	Good	Unsuitable	Unsuitable	Frost heaving
Edgemont (EdB, EdD)	Good	Low	Poor	Unsuitable	Good	Variable depth to bedrock.
Hartleton (HhA, HhB2, HhC2, HhC3, HhD2, HhD3, HrB, HrD).	Good	Low	Fair	Unsuitable	Good	Variable depth to bedrock.
Holly (Hs)	Poor	High	Good in surface layer.	Unsuitable	Fair	Flooding; high water table.
Klinesville (KaB2, KaC2, KaC3, KaD2, KaD3, KkE, KlB, KlD, KlF). (For properties of the Leck Kill soil in mapping units (KkE, KlB, KlD, and KlF, refer to interpretations in this table for Leck Kill very stony silt loam, deep.)	Good	Low	Poor	Unsuitable	Fair; very little soil material.	Shallowness to bedrock.
Lackawanna:						
Channery loam (LaB2, LaC2, LaD2)	Good	Low	Good	Unsuitable	Good	No undesirable features.
Very stony loam (LcB, LcD, LdF) (For properties of the Oquaga soil in mapping unit LdF, refer to interpretations in this table for the Oquaga soil series.)	Good	Low	Poor	Unsuitable	Good	Shallowness to bedrock.
Laidig (LeB2, LeC2, LfB, LfD)	Fair	Low	Fair to poor.	Unsuitable	Good	No undesirable features.
Lawrenceville (LgB, LgC2) (For properties of the Duncannon soil in mapping units LgB and LgC2, see interpretations in this table for the Duncannon soil series.)	Poor	High	Good	Unsuitable	Poor	Seasonally high water table; frost heaving.
Leck Kill:						
Channery silt loam (LkA, LkB2, LkC2, LkC3, LkD2, LkD3).	Good	Low	Fair	Unsuitable	Good	Variable depth to bedrock.
Channery silt loam, deep (LlA, LlB2, LlC2, LlC3). Very stony silt loam, deep (LmB, LmD, LmE).	Good	Low	Fair to good.	Unsuitable	Good	No undesirable features.
Lickdale (Ln, Lo)	Unsuitable	High	Good in surface layer.	Unsuitable	Poor to unsuitable.	High water table; frost heaving.

of the soils—Continued

Soil features adversely affecting—Continued						
Construction and maintenance of pipelines	Farm ponds		Agricultural drainage	Irrigation	Terraces and diversions	Waterways
	Reservoir area	Dikes and embankments				
Moderate corrosivity (steel).	Moderate permeability.	Instability	Erodibility	High erodibility	Erodibility	Erodibility.
Variable depth to bedrock; stoniness; moderate corrosivity (steel).	Moderately rapid permeability.	Stoniness; moderately rapid permeability.	Not needed	Low moisture-holding capacity; stoniness	Stoniness	Stoniness.
Variable depth to shale; some areas very stony.	Shallowness to shale.	Moderate permeability; some areas very stony.	Not needed	Moderate moisture-holding capacity.	Some areas very stony.	Some areas very stony.
Flooding; high water table; high corrosivity (steel).	Flooding; underlain by gravel in some places.	Flooding	Flooding; moderately slow permeability.	High water table.	Flooding	Flooding; low gradient.
Shallowness to shale	Shallowness to bedrock; pervious bedrock.	Scarcity of soil material.	Not needed	Low moisture-holding capacity.	Shallowness to bedrock.	Shallowness to bedrock.
No undesirable features.	Moderate permeability.	No undesirable features.	Not needed	No undesirable features.	No undesirable features.	No undesirable features.
Shallowness to bedrock.	Moderate permeability.	Stoniness; some areas steep.	Not needed	Stoniness	Stoniness	Stoniness.
Some areas very stony	Moderate permeability.	Some areas very stony.	Not needed	Pan at a depth of more than 3 feet.	Some areas very stony.	Some areas very stony.
Fluctuating water table; moderate corrosivity (steel).	Moderate permeability.	Instability	Erodibility	High erodibility	Erodibility	Erodibility.
Variable depth to bedrock.	Shallowness to shale.	Moderate permeability.	Not needed	Moderate moisture-holding capacity.	No undesirable features.	No undesirable features.
Some areas very stony	Moderate permeability.	Some areas very stony.	Not needed	Some areas stony.	Some areas very stony.	Some areas very stony.
High water table; high corrosivity (steel); some areas very stony.	No undesirable features.	Instability; some areas very stony.	Slow permeability.	High water table.	High water table; some areas very stony.	High water table; low gradient; some areas very stony.

TABLE 6.—*Engineering interpretation*

Soil series, soil types, land types, and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of— Topsoil	Sand and gravel	Road fill	Soil features adversely affecting— Highway location
Litz (LpB2, LpC2, LrC3, LrD3, LrE2) (For properties of the Weikert soil in mapping units LrC3, LrD3, and LrE2, refer to interpretations in this table for the Weikert soil series.)	Good	Low	Fair	Unsuitable	Good	Shallowness to bedrock.
Lordstown (LsB2, LsC2, LsD2, LtB, LtD, LtF).	Good	Low	Fair	Unsuitable	Good	Variable depth to bedrock.
Made land (Ma)	Variable	Variable	Unsuitable	Unsuitable	Variable	Variable
Middlebury (Mb, Md)	Poor	High	Fair	Unsuitable	Fair	Flooding; seasonally high water table; frost heaving in some areas.
Mine dumps (Mn)	Good	Low	Unsuitable	Unsuitable	Variable	Variable
Morris (MrB, MsB)	Poor	High	Fair to poor in surface layer.	Unsuitable	Fair	Seasonally high water table; frost heaving.
Mucky peat (Mu)	Unsuitable	High	Poor	Unsuitable	Unsuitable	Instability; high water table.
Oquaga (OcB2, OcC2, OcD2, OsB, OsD)	Good	Moderate	Poor	Unsuitable	Good; scarcity of soil material.	Shallowness
Papakating (Pa)	Poor	High	Good in surface layer.	Unsuitable	Poor	Flooding; high water table.
Pekin (PkA, PkB2)	Poor	Moderate	Good in surface layer.	Good	Good	Seasonally high water table; frost heaving.
Ravenna (RaA, RaB)	Poor	High	Good in surface layer.	Unsuitable	Fair	High water table
Riverwash (Rw)	Unsuitable	High	Good in surface layer.	Unsuitable	Unsuitable	Frequent flooding; instability.
Shelmadine (SdA, SdB2, Sh)	Poor	High	Poor	Unsuitable	Poor	High water table
Steep very stony land (Sp)	Good	Low	Unsuitable	Unsuitable	Very little soil material.	Shallowness
Strip mine spoil (St)	Good	Low	Unsuitable	Unsuitable	Fair to good.	Uneven settlement

of the soils—Continued

Soil features adversely affecting—Continued						
Construction and maintenance of pipelines	Farm ponds		Agricultural drainage	Irrigation	Terraces and diversions	Waterways
	Reservoir area	Dikes and embankments				
Shallowness to shale	Shallowness to shale.	Moderate permeability.	Not needed	Shallowness	No undesirable features.	Shallowness.
Variable depth to bedrock; some areas very stony.	Shallowness to bedrock.	Moderate permeability; some areas very stony.	Not needed	Low moisture-holding capacity.	Some areas very stony.	Some areas very stony.
Variable	Variable	Variable	Variable	Variable	Variable	Variable.
Flooding; fluctuating water table.	Flooding; moderate permeability.	Flooding; erodibility.	Flooding; lack of outlets.	Moderate moisture-holding capacity; flooding.	Flooding	Flooding; low gradient.
High corrosivity	Pervious material.	Pervious material.	Not needed	Not needed	Not needed	Not needed.
Fluctuating water table; high corrosivity (steel).	Some areas very stony.	Some areas very stony.	Slow permeability.	Seasonally high water table; slow permeability.	Seasonally high water table; some areas very stony.	Seasonally high water table; some areas very stony.
High water table; instability; high corrosivity.	Unsuitable	Permeability; instability.	Lack of outlets; subsidence.	Extreme variability.	Instability	High water table; instability; low gradient.
Shallowness to bedrock; some areas very stony.	Shallowness to bedrock.	Very little soil material.	Not needed	Low moisture-holding capacity; some areas very stony.	Shallowness to bedrock.	Shallowness to bedrock; some areas very stony.
Flooding; high water table; high corrosivity (steel).	Flooding	Instability; high water table.	Low permeability; lack of outlets.	High water table.	Instability; high water table.	High water table; low gradient.
Fluctuating water table.	Underlying gravel.	Moderate permeability.	Cobbles	Moderate moisture-holding capacity.	Cobbles	Cobbles.
High water table; high corrosivity (steel).	No undesirable features.	No undesirable features.	Slow permeability.	High water table.	High water table.	High water table.
Frequent flooding; instability.	Flooding	Instability	Lack of outlets	High water table.	Instability; wetness; flooding.	Instability; wetness; flooding; low gradient.
High water table; moderate corrosivity (steel); some areas very stony.	No undesirable features.	Instability; some areas very stony.	Slow permeability.	Slow permeability; some areas very stony.	High water table; some areas very stony.	High water table; some areas very stony.
Stoniness; shallowness	Not used	Very little soil material.	Not needed	Not needed	Not used	Not used.
Uneven settlement	Instability; stoniness.	Stoniness; uneven settlement.	Nonagricultural	Nonagricultural	Stoniness	Stoniness.

TABLE 6.—*Engineering interpretations*

Soil series, soil types, land types, and map symbols	Suitability for winter grading	Susceptibility to frost action	Suitability as source of— Topsoil	Suitability as source of— Sand and gravel	Suitability as source of— Road fill	Soil features adversely affecting— Highway location
Tioga:						
Fine sandy loam (Tf); Gravelly loam (Tg); Silt loam (Ts)	Fair	Moderate	Good	Generally fair; poor in silt loam soils.	Generally good; fair in silt loam soils.	Flooding
Silt loam, high bottom (Tt)	Fair	Moderate	Good	Fair	Good	Occasional flooding
Washington (WaA, WaB2, WaC2)	Poor	Moderate	Good	Unsuitable	Fair	No undesirable features.
Watson (WbA, WbB2, WbC2)	Poor	Moderate	Good in surface layer.	Unsuitable	Fair	Seasonally high water table; frost heaving.
Weikert (WcB2 WcC2, WcD2, WcF2, WeD, WeF).	Good	Low	Poor	Unsuitable	Fair to good.	Shallowness
Wellsboro (WfB2, WfC2, WhB)	Poor	Moderate	Good in surface layer.	Unsuitable	Fair	Seasonally high water table; frost heaving.
Westmoreland (WmB2, WmC2)	Fair	Moderate	Good	Unsuitable	Fair	Variable depth to rock.
Wiltshire (WnA, WnB2, WnC2)	Poor	Moderate	Good in surface layer.	Unsuitable	Fair	Seasonally high water table; frost heaving; erodibility.
Wooster (WoB2, WoC2, WoD2, WpD, WsB). (For properties of the Canfield soil in mapping unit WsB, refer to interpretations in this table for the Canfield soil series.)	Good	Low	Good	Unsuitable	Good	No undesirable features.
Zipp (Zp)	Poor	High	Good in surface layer.	Unsuitable	Poor	High water table; frost heaving.

BUILDING SITE GROUP 3

This group is made up of Dekalb, Edgemont, Hartleton, Lackawanna, Laidig, Leck Kill, Lordstown, Wooster, and Canfield soils. These soils are well drained, are permeable, and have slopes ranging from 0 to 12 perment. Most of the soils are moderately deep, but some are deep and very stony. Some of the soils are channery, and some are moderately eroded.

The slopes are favorable for community development, and the soils generally make good foundations, though suitability for foundations does vary. In many places excavations reach rock of varying hardness because depth to bedrock generally is 2 to 4 feet, and the upper part of the bedrock is partly weathered and soft. Boulders in the very stony soils add to the cost of excavating and grading.

Except for the Canfield soil, these soils are well drained, are permeable, and have satisfactory rates of percolation, but in many places the bedrock near the surface limits the capacity for holding water. The performance of septic tanks varies. Some areas become waterlogged when use for disposing of effluent is excessive. These soils are fairly good for lawns, gardens, shrubs, and trees, but in many places stones are plentiful enough to make it hard to prepare a smooth seedbed.

Except for the very stony soils, the soils in this group are fairly good for farming.

of the soils—Continued

Soil features adversely affecting—Continued							
Construction and maintenance of pipelines	Farm ponds		Agricultural drainage	Irrigation	Terraces and diversions	Waterways
	Reservoir area	Dikes and embankments				
Flooding; moderate corrosivity (steel) in some areas.	Flooding; moderately rapid permeability.	Flooding; moderately rapid permeability; erodibility.	Not needed	Moderate moisture-holding capacity except in silt loam soils.	Flooding	Flooding; low gradient.
Occasional flooding	Moderately rapid permeability.	Moderately rapid permeability; erodibility.	Not needed	No undesirable features.	No undesirable features.	Low gradient.
Moderate corrosivity (steel).	Solution caverns in some places.	No undesirable features.	Not needed	No undesirable features.	No undesirable features.	No undesirable features.
Fluctuating water table; moderate corrosivity (steel).	No undesirable features.	No undesirable features.	Slow permeability.	Moderate moisture-holding capacity.	No undesirable features.	No undesirable features.
Shallowness; some areas very stony.	Rapid permeability.	Very little soil material.	Not needed	Low available moisture capacity.	Shallowness to shale; some areas very stony.	Some areas steep.
Fluctuating water table; moderate corrosivity (steel).	No undesirable features.	Some areas very stony.	Some areas very stony.	Moderate moisture-holding capacity.	Some areas very stony.	Some areas very stony.
Variable depth to rock; moderate to high corrosivity (steel).	Moderately slow permeability.	Moderately slow permeability.	Not needed	Moderately slow permeability.	Variable depth to bedrock.	No undesirable features.
Fluctuating water table.	Solution caverns.	Erodibility	No undesirable features.	Moderate moisture-holding capacity.	No undesirable features.	No undesirable features.
No undesirable features.	Moderate permeability.	Moderate permeability.	Not needed	No undesirable features.	No undesirable features.	No undesirable features.
High water table; high corrosivity (steel).	No undesirable features.	Low strength	Slow permeability.	High water table.	High water table.	High water table; low gradient.

BUILDING SITE GROUP 4

The soils in this group are well drained and permeable. They have slopes ranging from 12 to 35 percent. These soils are in the Dekalb, Edgemont, Hartleton, Lackawanna, Laidig, Leck Kill, Lordstown, and Wooster series. Most of them are moderately deep, but some are deep and very stony. Also, some of these soils are channery, and some are moderately eroded or severely eroded.

The slopes of most of the soils in this group are satisfactory for community development, but on slopes of more than 20 percent, the difficulty in building increases. These soils make fairly good foundations for small buildings, but in excavating some bedrock generally has to be removed. The very stony soils contain boulders that add to the cost of excavating and grading. Soil creep occurs on the steeper slopes. During and after construction, surface runoff may cause severe gullying.

These soils do not have a seasonally high water table, and internal drainage and aeration are good, but if the liquid effluent from septic tanks is added to the shallower soils, their capacity for disposal may be exceeded. After lateral seepage, the effluent comes to the surface farther down the slope. In other places the bedrock is permeable enough for the disposal fields of the septic tanks to perform well. These soils are fairly good for lawns, shrubs, and trees, but in many places erosion is a problem before the vegetation is established. Because most of

TABLE 7.—*Limitations to use*

Map symbol	Soil	Degree and kind of limitation for— Disposal of sewage effluent	Sewage lagoons	Foundations for houses of 3 stories or less
AaA	Albrights gravelly silt loam, 0 to 3 percent slopes.	Severe: seasonally high water table.	Slight	Moderate: seasonally high water table.
AaB2	Albrights gravelly silt loam, 3 to 8 percent slopes, moderately eroded.	Severe: seasonally high water table.	Moderate: slopes	Moderate: seasonally high water table.
AaC	Albrights gravelly silt loam, 8 to 15 percent slopes.	Severe: seasonally high water table.	Severe: slopes	Moderate: seasonally high water table.
AeA	Allenwood silt loam, 0 to 3 percent slopes.	Slight	Severe: rapid permeability.	Slight
AeB2	Allenwood silt loam, 3 to 12 percent slopes, moderately eroded.	Moderate: slopes	Severe: slopes	Moderate: slopes
AeC2	Allenwood silt loam, 12 to 20 percent slopes, moderately eroded.	Severe: slopes	Severe: slopes	Severe: slopes
AnB2	Allis silt loam, neutral substratum, 3 to 8 percent slopes, moderately eroded.	Severe: seasonally high water table.	Severe: slopes and shallowness.	Severe: seasonally high water table.
ArA	Alvira silt loam, 0 to 3 percent slopes.	Severe: high water table.	Slight	Moderate: seasonally high water table.
ArB	Alvira silt loam, 3 to 8 percent slopes.	Severe: high water table.	Moderate: slopes	Moderate: seasonally high water table.
AsB2	Alvira shaly silt loam, 3 to 8 percent slopes, moderately eroded.	Severe: seasonally high water table.	Moderate: slopes	Severe: seasonally high water table.
AsC2	Alvira shaly silt loam, 8 to 15 percent slopes, moderately eroded.	Severe: seasonally high water table.	Severe: slopes	Severe: seasonally high water table.
At	Atherton loam.	Severe: high water table.	Severe: rapid permeability in substratum.	Severe: high water table.
Ba Bb Bc	Barbour fine sandy loam. Barbour gravelly loam. Barbour silt loam.	Severe: flooding	Severe: flooding	Severe: flooding
Bd	Basher fine sandy loam.	Severe: flooding	Severe: flooding	Severe: flooding
BeB2	Belmont silt loam, 3 to 12 percent slopes, moderately eroded.	Slight or moderate: slopes.	Severe: slopes; moderate permeability.	Slight or moderate: slopes.
BeC2	Belmont silt loam, 12 to 20 percent slopes, moderately eroded.	Severe: slopes	Severe: slopes; moderate permeability.	Moderate: slopes
BkB2	Berks shaly silt loam, 3 to 12 percent slopes, moderately eroded.	Severe: shallowness	Severe: shallowness	Severe: shallowness
BkC2	Berks shaly silt loam, 12 to 20 percent slopes, moderately eroded.	Severe: shallowness; slopes.	Severe: slopes	Severe: shallowness; slopes.
BrA BrB	Braceville loam, 0 to 3 percent slopes. Braceville loam, 3 to 8 percent slopes.	Severe: seasonally high water table.	Severe: moderately slow permeability in substratum.	Moderate: seasonally high water table.

of soils in community development

Degree and kind of limitation for—Continued					
Landscaping and lawns	Streets and parking lots	Athletic fields	Parks and play areas	Sanitary land fill (area)	Cemeteries
Slight	Moderate: seasonally high water table.	Moderate: seasonally high water table; gravelly surface.	Slight	Moderate: seasonally high water table.	Severe: seasonally high water table.
Slight	Moderate: slopes	Moderate: seasonally high water table; gravelly surface.	Slight	Moderate: seasonally high water table.	Severe: seasonally high water table.
Moderate: slopes	Severe: slopes	Severe: slopes	Moderate: slopes	Moderate: seasonally high water table.	Severe: seasonally high water table.
Slight	Slight	Slight	Slight	Slight	Slight.
Severe: slopes	Severe: slopes	Severe: slopes	Moderate: slopes	Moderate: slopes	Moderate: slopes.
Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes.
Moderate: seasonally high water table.	Severe: seasonally high water table.	Severe: seasonally high water table.	Moderate: seasonally high water table.	Severe: seasonally high water table.	Severe: seasonally high water table.
Moderate: seasonally high water table.	Moderate: seasonally high water table.	Severe: seasonally high water table.	Moderate: seasonally high water table.	Severe: seasonally high water table.	Severe: seasonally high water table.
Moderate: seasonally high water table.	Moderate: seasonally high water table.	Severe: seasonally high water table.	Moderate: seasonally high water table.	Severe: seasonally high water table.	Severe: seasonally high water table.
Severe: seasonally high water table.	Severe: seasonally high water table.	Severe: seasonally high water table.	Moderate: seasonally high water table.	Severe: seasonally high water table.	Severe: seasonally high water table.
Severe: seasonally high water table.	Severe: slopes	Severe: slopes	Moderate: seasonally high water table; slopes.	Severe: seasonally high water table.	Severe: seasonally high water table.
Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.
Moderate: flooding.	Moderate: flooding	Moderate: flooding	Slight	Severe: flooding	Severe: flooding.
Moderate: flooding.	Moderate: flooding	Moderate: flooding; seasonally high water table.	Moderate: flooding	Severe: flooding	Severe: flooding.
Slight	Moderate: slopes	Moderate: slopes	Slight	Slight	Moderate: slopes.
Moderate: slopes	Severe: slopes	Severe: slopes	Moderate: slopes	Moderate: slopes	Moderate: slopes.
Moderate: shallowness.	Moderate: slopes	Severe: shaly surface; slopes; shallowness.	Slight to moderate: slopes.	Severe: shallowness	Severe: shallowness.
Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: shallowness	Severe: slopes; shallowness.
Slight	Moderate: seasonally high water table; slopes.	Moderate: seasonally high water table.	Slight	Moderate: seasonally high water table.	Moderate: seasonally high water table.

TABLE 7.—*Limitations to use of soils in*

Map symbol	Soil	Degree and kind of limitation for—		
		Disposal of sewage effluent	Sewage lagoons	Foundations for houses of 3 stories or less
BuB BvB	Buchanan cobbly loam, 3 to 8 percent slopes. Buchanan very stony loam, 0 to 8 percent slopes.	Severe: high water table.	Moderate: slopes	Moderate: seasonally high water table.
CaB2	Calvin shaly silt loam, neutral substratum, 3 to 12 percent slopes, moderately eroded.	Severe: shallowness	Severe: moderately rapid permeability; shallowness.	Severe: shallowness
CaC2	Calvin shaly silt loam, neutral substratum, 12 to 20 percent slopes, moderately eroded.	Severe: shallowness	Severe: slopes	Severe: shallowness
CbD2 CbE2	Calvin and Klinesville soils, neutral substrata, 20 to 35 percent slopes, moderately eroded. Calvin and Klinesville soils, neutral substrata, 35 to 50 percent slopes, moderately eroded.	Severe: slopes; shallowness.	Severe: slopes	Severe: slopes
CfB2	Canfield channery silt loam, 3 to 8 percent slopes, moderately eroded.	Severe: seasonally high water table.	Moderate: slopes	Moderate: seasonally high water table.
CgA ChA	Chenango gravelly sandy loam, 0 to 3 percent slopes. Chenango silt loam, 0 to 3 percent slopes.	Slight (possible ground water contamination).	Severe: rapid permeability.	Slight
CgB2 ChB2	Chenango gravelly sandy loam, 3 to 12 percent slopes, moderately eroded. Chenango silt loam, 3 to 12 percent slopes, moderately eroded.	Moderate: slopes; (ground water contamination).	Severe: rapid permeability.	Moderate: slopes
CgC2 CgD3	Chenango gravelly sandy loam, 12 to 20 percent slopes, moderately eroded. Chenango gravelly sandy loam, 20 to 35 percent slopes, severely eroded.	Severe: slopes	Severe: rapid permeability.	Severe: slopes
DaB2	Dekalb channery loam, 3 to 12 percent slopes, moderately eroded.	Moderate: shallow to bedrock.	Severe: rapid permeability.	Severe: shallow to bedrock.
DaC2	Dekalb channery loam, 12 to 20 percent slopes, moderately eroded.	Severe: shallow to bedrock.	Severe: rapid permeability.	Severe: shallow to bedrock.
DkB	Dekalb very stony loam, 0 to 12 percent slopes.	Severe: slopes	Severe: rapid permeability.	Severe: depth to bedrock.
DkD DkF	Dekalb very stony loam, 12 to 35 percent slopes. Dekalb very stony loam, 35 to 100 percent slopes.	Severe: slopes	Severe: rapid permeability.	Severe: slopes
EdB	Edgemont very stony loam, 0 to 12 percent slopes.	Moderate to severe: slopes.	Severe: rapid permeability.	Moderate: slopes; stoniness.
EdD	Edgemont very stony loam, 12 to 35 percent slopes.	Severe: slopes	Severe: slopes	Severe: slopes
HhA	Hartleton channery silt loam, 0 to 3 percent slopes.	Moderate: shallowness	Severe: moderately rapid permeability.	Moderate: shallowness
HhB2	Hartleton channery silt loam, 3 to 12 percent slopes, moderately eroded.	Moderate: slopes	Severe: moderately rapid permeability.	Moderate: shallowness
HhC2 HhC3	Hartleton channery silt loam, 12 to 20 percent slopes, moderately eroded. Hartleton channery silt loam, 12 to 20 percent slopes, severely eroded.	Moderate: slopes; shallowness.	Severe: slopes	Moderate: slopes; shallowness.
HhD2	Hartleton channery silt loam, 20 to 35 percent slopes, moderately eroded.	Severe: slopes	Severe: slopes	Severe: slopes

community development—Continued

Degree and kind of limitation for—Continued					
Landscaping and lawns	Streets and parking lots	Athletic fields	Parks and play areas	Sanitary land fill (area)	Cemeteries
Slight	Moderate: slopes	Moderate: cobbly surface; slopes.	Slight	Moderate: seasonally high water table.	Severe: seasonally high water table.
Moderate: shallowness.	Moderate: shallowness; slopes.	Severe: slopes; shallowness; shaly surface.	Slight to moderate; shallowness; slopes.	Severe: shallowness	Severe: shallowness.
Severe: shallowness.	Severe: slopes	Severe: slopes	Severe: shallowness; slopes.	Severe: shallowness	Severe: shallowness.
Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes.
Slight	Moderate: seasonally high water table.	Moderate: high water table; slopes.	Slight	Severe: seasonally high water table.	Severe: seasonally high water table.
Slight	Slight	Moderate: coarse fragments.	Slight	Slight (possible ground water contamination).	Slight.
Slight	Moderate to severe: slopes.	Moderate to severe: slopes.	Slight to moderate: slopes.	Slight: (possible ground water contamination).	Slight.
Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes.
Moderate: coarse fragments.	Severe: slopes	Severe: coarse fragments.	Moderate: slopes	Severe: shallow to bedrock.	Severe: shallow to bedrock.
Severe: slopes	Severe: slopes	Severe: coarse fragments.	Severe: slopes	Severe: shallow to bedrock.	Severe: slopes.
Moderate: slopes	Severe: slopes	Severe: stoniness	Moderate: slopes	Severe: shallow to bedrock.	Severe: shallow to bedrock.
Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: shallow to bedrock.
Moderate: stoniness.	Severe: slopes	Severe: slopes; stoniness.	Moderate: stoniness.	Severe: slopes	Severe: slopes.
Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes.
Moderate: shallowness.	Slight	Moderate: channery surface.	Slight	Moderate: shallowness.	Moderate: shallowness.
Moderate: shallowness.	Moderate: slopes	Moderate: slopes	Slight	Moderate: shallowness.	Moderate: shallowness.
Moderate or severe: slopes.	Severe: slopes	Severe: slopes	Moderate: slopes	Moderate: shallowness; slopes.	Moderate: shallowness; slopes.
Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes.

TABLE 7.—*Limitations to use of soils in*

Map symbol	Soil	Degree and kind of limitation for—		
		Disposal of sewage effluent	Sewage lagoons	Foundations for houses of 3 stories or less
HhD3	Hartleton channery silt loam, 20 to 35 percent slopes, severely eroded.			
HrB	Hartleton very stony silt loam, 0 to 12 percent slopes.	Moderate: shallowness.	Severe: moderately rapid permeability.	Moderate: stoniness
HrD	Hartleton very stony silt loam, 12 to 35 percent slopes.	Severe: slopes	Severe: slopes	Moderate: stoniness
Hs	Holly silt loam.	Severe: flooding	Severe: flooding	Severe: flooding
KaB2	Klinesville shaly silt loam, 3 to 12 percent slopes, moderately eroded.	Severe: shallow to bedrock; slopes.	Severe: shallow to bedrock; slopes.	Severe: shallow to bedrock.
KaC2	Klinesville shaly silt loam, 12 to 20 percent slopes, moderately eroded.			
KaC3	Klinesville shaly silt loam, 12 to 20 percent slopes, severely eroded.			
KaD2	Klinesville shaly silt loam, 20 to 35 percent slopes, moderately eroded.	Severe: slopes; shallowness.	Severe: slopes	Severe: slopes; shallowness.
KaD3	Klinesville shaly silt loam, 20 to 35 percent slopes, severely eroded.			
KkE	Klinesville and Leck Kill shaly silt loams, 35 to 70 percent slopes.			
KlD	Klinesville and Leck Kill very stony silt loams, 12 to 35 percent slopes.			
KlF	Klinesville and Leck Kill very stony silt loams, 35 to 100 percent slopes.			
KlB	Klinesville and Leck Kill very stony silt loams, 0 to 12 percent slopes.	Severe: shallowness	Severe: slopes	Severe: shallowness
LaB2	Lackawanna channery loam, 3 to 12 percent slopes, moderately eroded.	Moderate: slopes	Severe: slopes	Slight
LaC2	Lackawanna channery loam, 12 to 20 percent slopes, moderately eroded.	Severe: slopes	Severe: slopes	Moderate: slopes
LaD2	Lackawanna channery loam, 20 to 35 percent slopes, moderately eroded.	Severe: slopes	Severe: slopes	Severe: slopes
LcD	Lackawanna very stony loam, 12 to 35 percent slopes.			
LdF	Lackawanna and Oquaga very stony soils, 35 to 100 percent slopes.			
LcB	Lackawanna very stony loam, 0 to 12 percent slopes.	Moderate: slopes	Severe: slopes	Moderate: stoniness
LeB2	Laidig gravelly loam, 3 to 12 percent slopes, moderately eroded.	Severe: slopes; moderate permeability.	Moderate or severe: slopes.	Slight
LeC2	Laidig gravelly loam, 12 to 20 percent slopes, moderately eroded.	Severe: slopes; moderate permeability.	Severe: slopes	Moderate: slopes
LfB	Laidig very stony loam, 0 to 12 percent slopes.	Severe: slopes; moderate permeability.	Severe: slopes; stoniness.	Moderate: stoniness
LfD	Laidig very stony loam, 12 to 35 percent slopes.	Severe: slopes	Severe: slopes	Severe: slopes
LgB	Lawrenceville and Duncannon silt loams, 3 to 8 percent slopes.			
	Lawrenceville soil	Severe: seasonally high water table.	Moderate: slopes	Moderate: seasonally high water table.
	Duncannon soil	Slight	Moderate: slopes	Slight

community development—Continued

Degree and kind of limitation for—Continued					
Landscaping and lawns	Streets and parking lots	Athletic fields	Parks and play areas	Sanitary land fill (area)	Cemeteries
Moderate: slopes	Moderate or severe: slopes.	Severe: stoniness; slopes.	Moderate: slopes	Moderate: stoniness	Moderate: stoniness.
Severe: stoniness; slopes.	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: stoniness.
Severe: flooding	Severe: flooding	Severe: flooding; wetness.	Moderate: flooding	Severe: flooding	Severe: flooding.
Severe: shallow to bedrock.	Severe: shallow to bedrock.	Severe: slopes	Moderate: slopes	Severe: shallow to bedrock.	Severe: shallow to bedrock.
Severe: slopes; shallowness.	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes; shallowness.	Severe: slopes.
Severe: shallowness.	Moderate or severe: slopes.	Severe: stoniness; slopes.	Slight	Moderate: stoniness; shallowness.	Moderate: stoniness; shallowness.
Moderate: slopes	Severe: slopes	Severe: slopes	Moderate: slopes	Slight	Slight.
Moderate: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Moderate: slopes	Moderate: slopes.
Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Moderate to severe: slopes.	Severe: slopes.
Moderate: stoniness.	Severe: slopes	Severe: slopes	Moderate: slopes	Moderate: slopes	Severe: stoniness.
Slight	Moderate or severe: slopes.	Moderate: slopes	Moderate: slopes	Slight	Slight.
Moderate: slopes	Severe: slopes	Severe: slopes	Moderate: slopes	Slight	Moderate: slopes.
Moderate: stoniness.	Severe: slopes	Severe: slopes; stoniness.	Slight	Moderate: stoniness	Severe: stoniness.
Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes; stoniness.	Severe: stoniness.
Slight	Moderate: slopes	Moderate: slopes	Slight	Moderate: seasonally high water table.	Moderate: seasonally high water table.
Slight	Moderate: slopes	Moderate: slopes	Slight	Slight	Slight.

TABLE 7.—*Limitations to use of soils in*

Map symbol	Soil	Degree and kind of limitation for—		
		Disposal of sewage effluent	Sewage lagoons	Foundations for houses of 3 stories or less
LgC2	Lawrenceville and Duncannon silt loams, 8 to 12 percent slopes, moderately eroded.			
	Lawrenceville soil	Severe: seasonally high water table.	Severe: slopes	Moderate: seasonally high water table; slopes.
	Duncannon soil	Severe: seasonally high water table.	Severe: slopes	Moderate: seasonally high water table.
LkA	Leck Kill channery silt loam, 0 to 3 percent slopes.	Moderate: shallowness	Severe: moderate permeability.	Moderate: shallowness
LkB2	Leck Kill channery silt loam, 3 to 12 percent slopes, moderately eroded.	Moderate: slopes	Severe: slopes	Moderate: shallowness
LkC2 LkC3	Leck Kill channery silt loam, 12 to 20 percent slopes, moderately eroded. Leck Kill channery silt loam, 12 to 20 percent slopes, severely eroded.	Moderate or severe: slopes; shallowness.	Severe: slopes	Moderate: shallowness
LkD2 LkD3	Leck Kill channery silt loam, 20 to 35 percent slopes, moderately eroded. Leck Kill channery silt loam, 20 to 35 percent slopes, severely eroded.	Severe: slopes	Severe: slopes	Severe: slopes
LlA	Leck Kill channery silt loam, deep, 0 to 3 percent slopes.	Slight	Severe: moderate permeability.	Slight
LlB2	Leck Kill channery silt loam, deep, 3 to 12 percent slopes, moderately eroded.	Slight	Severe: moderate permeability.	Slight
LlC2 LlC3	Leck Kill channery silt loam, deep, 12 to 20 percent slopes, moderately eroded. Leck Kill channery silt loam, deep, 12 to 20 percent slopes, severely eroded.	Moderate: slopes	Severe: slopes	Moderate: slopes
LmB	Leck Kill very stony silt loam, deep, 0 to 12 percent slopes.	Slight	Severe: moderate permeability.	Moderate: stoniness
LmD LmE	Leck Kill very stony silt loam, deep, 12 to 35 percent slopes. Leck Kill very stony silt loam, deep, 35 to 60 percent slopes.	Severe: slopes	Severe: slopes	Severe: slopes; stoniness.
Ln Lo	Lickdale silt loam. Lickdale very stony silt loam.	Severe: high water table.	Slight	Severe: high water table.
LpB2 LpC2	Litz silt loam, 3 to 12 percent slopes, moderately eroded. Litz silt loam, 12 to 20 percent slopes, moderately eroded.	Severe: shallowness	Severe: shallowness; slopes.	Severe: shallowness
LrC3	Litz and Weikert shaly silt loams, 12 to 20 percent slopes, severely eroded.	Severe: shallowness	Severe: slopes	Severe: shallowness
LrD3 LrE2	Litz and Weikert shaly silt loams, 20 to 35 percent slopes, severely eroded. Litz and Weikert shaly silt loams, 35 to 50 percent slopes, moderately eroded.	Severe: slopes	Severe: slopes	Severe: slopes
LsB2	Lordstown channery silt loam, 3 to 12 percent slopes, moderately eroded.	Severe: shallowness	Severe: slopes	Moderate: slopes
LsC2	Lordstown channery silt loam, 12 to 20 percent slopes, moderately eroded.	Severe: slopes	Severe: slopes	Moderate: slopes
LsD2	Lordstown channery silt loam, 20 to 35 percent slopes, moderately eroded.	Severe: slopes	Severe: slopes	Severe: slopes

community development—Continued

Degree and kind of limitation for—Continued					
Landscaping and lawns	Streets and parking lots	Athletic fields	Parks and play areas	Sanitary land fill (area)	Cemeteries
Moderate: slopes	Severe: slopes	Severe: slopes	Moderate: slopes	Moderate: seasonally high water table.	Moderate: seasonally high water table; slopes.
Moderate: slopes	Severe: slopes	Severe: slopes	Moderate: slopes	Slight	Moderate: seasonally high water table.
Moderate: shallowness.	Slight	Moderate: channery surface.	Slight	Moderate: shallowness.	Moderate: shallowness.
Moderate: shallowness.	Severe: slopes	Severe: slopes	Slight or moderate: slopes.	Moderate: depth to bedrock.	Moderate: depth to bedrock.
Moderate or severe: shallowness; slopes.	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes.
Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes.
Slight	Slight	Moderate: channery surface.	Slight	Slight	Slight.
Slight	Moderate: slopes	Moderate: slopes	Slight	Slight	Slight.
Moderate: slopes	Severe: slopes	Severe: slopes	Moderate: slopes	Moderate: slopes	Moderate: slopes.
Moderate: stoniness.	Moderate: slopes	Severe: stoniness	Slight	Moderate: stoniness	Moderate: stoniness.
Severe: slopes; stoniness.	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes.
Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.
Severe: shallowness.	Moderate or severe: slopes.	Moderate or severe: shallowness; slopes.	Moderate: shallowness.	Severe: shallowness	Severe: shallowness.
Severe: shallowness.	Severe: slopes	Severe: slopes	Moderate: shallowness.	Severe: shallowness	Severe: shallowness.
Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes.
Moderate: slopes	Moderate or severe: slopes.	Severe: slopes; channery surface.	Moderate: slopes	Moderate: depth to bedrock.	Moderate: depth to bedrock.
Moderate: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Moderate: slopes	Moderate: slopes.
Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes.

TABLE 7.—*Limitations to use of soils in*

Map symbol	Soil	Degree and kind of limitation for—		
		Disposal of sewage effluent	Sewage lagoons	Foundations for houses of 3 stories or less
LtB	Lordstown very stony silt loam, 0 to 12 percent slopes.	Moderate or severe: slopes.	Severe: slopes	Moderate: slopes
LtD LtF	Lordstown very stony silt loam, 12 to 35 percent slopes. Lordstown very stony silt loam, 35 to 100 percent slopes.	Severe: slopes	Severe: slopes	Severe: slopes
Ma	Made land.	Variable	Variable	Variable
Mb Md	Middlebury fine sandy loam. Middlebury silt loam.	Severe: flooding	Severe: flooding	Severe: flooding
Mn	Mine dumps.	Severe: surface and ground water contamination.	Severe: permeability	Severe: instability
MrB MsB	Morris channery silt loam, 3 to 8 percent slopes. Morris very stony silt loam, 0 to 8 percent slopes.	Severe: seasonally high water table.	Moderate: slopes	Severe: seasonally high water table.
Mu	Mucky peat.	Severe: flooding	Severe: organic soil	Severe: high water table; instability.
OcB2	Oquaga channery silt loam, 3 to 12 percent slopes, moderately eroded.	Severe: shallowness; slopes.	Severe: slopes	Severe: shallowness
OcC2	Oquaga channery silt loam, 12 to 20 percent slopes, moderately eroded.	Severe: slopes; shallowness.	Severe: slopes	Severe: shallowness
OcD2	Oquaga channery silt loam, 20 to 35 percent slopes, moderately eroded.	Severe: slopes	Severe: slopes	Severe: shallowness
OsB	Oquaga very stony silt loam, 0 to 12 percent slopes.	Severe: slopes; shallowness.	Severe: slopes	Severe: slopes; shallowness.
OsD	Oquaga very stony silt loam, 12 to 35 percent slopes.	Severe: slopes	Severe: slopes	Severe: slopes
Pa	Papakating silty clay loam.	Severe: flooding	Severe: highly organic soil; flooding.	Severe: flooding
PkA	Pekin silt loam, cobbly variant, 0 to 3 percent slopes.	Severe: seasonally high water table.	Severe: permeable substratum.	Moderate: seasonally high water table.
PkB2	Pekin silt loam, cobbly variant, 3 to 8 percent slopes, moderately eroded.	Severe: seasonally high water table.	Severe: permeable substratum.	Moderate: seasonally high water table.
RaA	Ravenna channery silt loam, 0 to 3 percent slopes.	Severe: seasonally high water table.	Slight	Severe: high water table.
RaB	Ravenna channery silt loam, 3 to 8 percent slopes.	Severe: seasonally high water table.	Moderate: slopes	Severe: high water table.
Rw	Riverwash.	Severe: flooding	Severe: flooding	Severe: flooding
SdA Sh	Shelmadine silt loam, 0 to 3 percent slopes. Shelmadine very stony silt loam.	Severe: high water table.	Slight	Severe: high water table.
SdB2	Shelmadine silt loam, 3 to 8 percent slopes, moderately eroded.	Severe: high water table.	Moderate: slopes	Severe: high water table.
Sp	Steep very stony land.	Severe: slopes; shallowness.	Severe: slopes	Severe: slopes; stoniness.

community development—Continued

Degree and kind of limitation for—Continued					
Landscaping and lawns	Streets and parking lots	Athletic fields	Parks and play areas	Sanitary land fill (area)	Cemeteries
Moderate: slopes	Severe: slopes	Severe: slopes; stoniness.	Moderate or severe: slopes.	Moderate: depth to bedrock.	Moderate: depth to bedrock.
Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes.
Variable	Variable	Variable	Variable	Variable	Variable.
Moderate: flooding.	Severe: flooding	Moderate: flooding	Moderate: flooding	Severe: flooding	Severe: flooding.
Severe: does not support vegetation.	Severe: slopes; instability.	Severe: coarse fragments.	Severe: does not support vegetation.	Variable	Severe: instability.
Moderate: seasonally high water table.	Moderate: seasonally high water table.	Severe: seasonally high water table.	Moderate: seasonally high water table.	Severe: seasonally high water table.	Severe: seasonally high water table.
Severe: high water table; organic soil.	Severe: high water table; instability.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.
Moderate: slopes	Moderate or severe: slopes.	Severe: slopes; channery surface.	Moderate: slopes	Severe: depth to bedrock.	Severe: depth to bedrock.
Moderate: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: shallowness	Severe: slopes.
Severe: shallowness.	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes.
Moderate: stoniness.	Severe: slopes	Severe: slopes; stoniness.	Moderate or severe: slopes.	Severe: depth to bedrock.	Severe: depth to bedrock.
Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes; stoniness.	Severe: slopes; stoniness.
Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding	Severe: high water table.	Severe: high water table.
Moderate: seasonally high water table.	Slight	Severe: cobbly surface.	Slight	Moderate: seasonally high water table.	Severe: seasonally high water table.
Moderate: seasonally high water table.	Moderate: slopes	Severe: cobbly surface.	Slight	Moderate: seasonally high water table.	Severe: seasonally high water table.
Moderate: high water table.	Moderate: seasonally high water table.	Severe: seasonally high water table.	Moderate: seasonally high water table.	Severe: seasonally high water table.	Severe: seasonally high water table.
Moderate: high water table.	Moderate: seasonally high water table; slopes.	Severe: seasonally high water table.	Moderate: seasonally high water table.	Severe: seasonally high water table.	Severe: seasonally high water table.
Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding.
Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.
Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.
Severe: slopes stoniness.	Severe: slopes; stoniness.	Severe: slopes; stoniness.	Severe: slopes; shallowness.	Severe: slopes; stoniness.	Severe: slopes; stoniness.

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TABLE 7.—*Limitations to use of soils in*

Map symbol	Soil	Degree and kind of limitation for—		
		Disposal of sewage effluent	Sewage lagoons	Foundations for houses of 3 stories or less
St	Strip mine spoil.	Variable	Severe: slopes; variable permeability.	Severe: instability
Tf Tg Ts Tt	Tioga fine sandy loam. Tioga gravelly loam. Tioga silt loam. Tioga silt loam, high bottom.	Severe: flooding	Severe: flooding	Severe: flooding
WaA	Washington silt loam, 0 to 3 percent slopes.	Slight: (possible ground water contamination).	Moderate: moderate permeability.	Slight
WaB2	Washington silt loam, 3 to 12 percent slopes, moderately eroded.	Moderate: (possible ground water contamination).	Moderate: moderate permeability.	Moderate: slopes
WaC2	Washington silt loam, 12 to 20 percent slopes, moderately eroded.	Severe: slopes	Severe: slopes	Moderate: slopes
WbA	Watson silt loam, 0 to 3 percent slopes.	Severe: seasonally high water table.	Slight	Moderate: seasonally high water table.
WbB2	Watson silt loam, 3 to 8 percent slopes, moderately eroded.	Severe: seasonally high water table.	Moderate: slopes	Moderate: seasonally high water table.
WbC2	Watson silt loam, 8 to 15 percent slopes, moderately eroded.	Severe: seasonally high water table.	Severe: slopes	Moderate: seasonally high water table.
WcB2 WcC2 WcD2 WcF2 WeD WeF	Weikert channery silt loam, 3 to 12 percent slopes, moderately eroded. Weikert channery silt loam, 12 to 20 percent slopes, moderately eroded. Weikert channery silt loam, 20 to 35 percent slopes, moderately eroded. Weikert channery silt loam, 35 to 80 percent slopes, moderately eroded. Weikert very stony silt loam, 12 to 35 percent slopes. Weikert very stony silt loam, 35 to 80 percent slopes.	Severe: shallowness; slopes.	Severe: rapid permeability; slopes.	Severe: shallowness; slopes.
WfB2	Wellsboro channery silt loam, 3 to 8 percent slopes, moderately eroded.	Severe: seasonally high water table.	Moderate: slopes	Moderate: seasonally high water table.
WfC2	Wellsboro channery silt loam, 8 to 15 percent slopes, moderately eroded.	Severe: seasonally high water table.	Severe: slopes	Moderate: seasonally high water table; slopes.
WhB	Wellsboro very stony silt loam, 0 to 8 percent slopes.	Severe: seasonally high water table.	Moderate: slopes	Moderate: seasonally high water table.
WmB2	Westmoreland silt loam, 3 to 12 percent slopes, moderately eroded.	Moderate: permeability.	Severe: slopes	Moderate: depth to bedrock.
WmC2	Westmoreland silt loam, 12 to 20 percent slopes, moderately eroded.	Severe: slopes	Severe: slopes	Moderate: depth to bedrock.
WnA	Wiltshire silt loam, 0 to 3 percent slopes.	Severe: seasonally high water table.	Slight	Moderate: seasonally high water table.
WnB2	Wiltshire silt loam, 3 to 8 percent slopes, moderately eroded.	Severe: seasonally high water table.	Moderate: slopes	Moderate: seasonally high water table.

community development—Continued

Degree and kind of limitation for—Continued					
Landscaping and lawns	Streets and parking lots	Athletic fields	Parks and play areas	Sanitary land fill (area)	Cemeteries
Severe: stoniness; acidity; slopes.	Severe: slopes; instability.	Severe: slopes; coarse fragments.	Severe: instability; slopes.	Variable	Severe: instability.
Moderate: flooding.	Moderate: flooding	Moderate: flooding	Moderate: flooding	Severe: flooding	Severe: flooding.
Slight	Slight	Slight	Slight	Slight: (possible ground water contamination).	Slight.
Moderate: slopes	Moderate or severe: slopes.	Moderate or severe: slopes.	Moderate: slopes	Moderate: slopes	Moderate: slopes.
Moderate or severe: slopes	Severe: slopes	Severe: slopes	Moderate or severe: slopes.	Moderate: slopes	Severe: slopes.
Slight	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Slight	Moderate: seasonally high water table.	Severe: seasonally high water table.
Slight	Moderate: seasonally high water table; slopes.	Moderate: seasonally high water table; slopes.	Slight	Moderate: seasonally high water table.	Severe: seasonally high water table.
Moderate: seasonally high water table.	Severe: slopes	Severe: slopes	Moderate: slopes	Moderate: seasonally high water table.	Severe: seasonally high water table.
Severe: shallowness; slopes.	Severe: shallowness; slopes.	Severe: shallowness; slopes.	Severe: shallowness; slopes.	Severe: shallowness; slopes.	Severe: shallowness; slopes.
Slight	Moderate: slopes	Moderate: slopes; channery surface.	Slight	Moderate: seasonally high water table.	Severe: seasonally high water table.
Moderate: slopes	Severe: slopes	Severe: slopes	Moderate: slopes	Moderate: seasonally high water table.	Severe: seasonally high water table.
Slight	Moderate: seasonally high water table.	Severe: stoniness	Slight	Severe: seasonally high water table; stoniness.	Severe: seasonally high water table.
Slight or moderate: slopes.	Moderate or severe: slopes.	Moderate or severe: slopes.	Slight or moderate: slopes.	Moderate: shallow to bedrock.	Moderate: shallow to bedrock.
Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Moderate or severe: slopes.	Moderate: shallow to bedrock.
Slight	Moderate: seasonally high water table.	Moderate: seasonally high water table.	Slight	Severe: seasonally high water table.	Severe: seasonally high water table.
Slight	Moderate: slopes	Moderate: slopes	Slight	Severe: seasonally high water table.	Severe: seasonally high water table.

TABLE 7.—*Limitations to use of soils in*

Map symbol	Soil	Degree and kind of limitation for—		
		Disposal of sewage effluent	Sewage lagoons	Foundations for houses of 3 stories or less
WnC2	Wiltshire silt loam, 8 to 15 percent slopes, moderately eroded.	Severe: seasonally high water table.	Severe: slopes	Moderate: slopes
WoB2	Wooster channery silt loam, 3 to 12 percent slopes, moderately eroded.	Severe: permeability	Moderate or severe: slopes.	Slight
WoC2	Wooster channery silt loam, 12 to 20 percent slopes, moderately eroded.	Severe: slopes; permeability.	Severe: slopes	Moderate: slopes
WoD2	Wooster channery silt loam, 20 to 35 percent slopes, moderately eroded.	Severe: slopes	Severe: slopes	Severe: slopes
WpD	Wooster very stony silt loam, 12 to 35 percent slopes.			
WsB	Wooster and Canfield very stony loams, 0 to 12 percent slopes.	Severe: seasonally high water table.	Severe: permeability	Moderate: stoniness
Zp	Zipp silt loam.	Severe: high water table.	Slight	Severe: high water table.

the soils contain many stones, obtaining a smooth seedbed is difficult.

BUILDING SITE GROUP 5

This group consists of shallow, well-drained soils that have slopes ranging from 0 to 12 percent. These soils are in the Berks, Calvin, Klinesville, Leck Kill, Litz, Oquaga, and Weikert series. Some of them are moderately eroded, some are channery, and some are stony.

The soils in this group are shallow to bedrock. Bedrock normally is hard enough to provide a good foundation for buildings, but this hardness makes deep excavation costly and difficult. Also, the impermeable bedrock close to the surface increases the difficulty of disposing of the effluent from septic tanks. The waste material that is left after construction generally contains so much raw broken rock that seeding or planting grasses, shrubs, or trees is not practical. Consequently, problems in revegetation and in establishing good lawns can be expected.

BUILDING SITE GROUP 6

The soils in this group are shallow, are well drained, and have slopes ranging from 12 to 35 percent. They are Berks, Calvin, Klinesville, Leck Kill, Litz, Weikert, and Oquaga soils. Some of these soils are shaly, some are very stony, and some are channery. Most of the soils are moderately eroded or severely eroded.

The soils in this group have moderate to severe limitations for most uses in community development, but they may be suitable for individual homesites or large tracts. They are shallow to bedrock, which in most places is hard enough to provide a good foundation. Deep excavations are difficult and costly. Disposing of the effluent from septic tanks is difficult. It may move laterally through the soil and come to the surface farther down the slope. After earth has been moved during development, establishing good lawns is difficult.

BUILDING SITE GROUP 7

This group consists of Calvin, Dekalb, Klinesville, Lackawanna, Leck Kill, Oquaga, Litz, Lordstown, and Weikert soils. These soils are well drained and have slopes ranging from 35 to 100 percent. Some of them are moderately eroded, some are very stony, some are shaly, and some are channery.

The slopes of the soils in this group are too steep for ordinary community development. Areas of these soils can be used, however, as open areas, parks, woodland, and game preserves. Investigating individual sites may reveal areas that are suitable for luxury housing.

BUILDING SITE GROUP 8

Most of the soils in this group are moderately well drained. Slopes range from 0 to 8 percent. The soils are of the Albrights, Braceville, Buchanan, Canfield, Duncannon, Lawrenceville, Pekin, Watson, Wellsboro, and Wiltshire series. Some of them are moderately eroded, some or cobbly, some are stony, and some are channery.

The soils in this group are on slopes that are favorable for community development, but during most years the water table stays high for several weeks in all the soils except the Duncannon. The sealing and draining of basements are necessary. Also, the water table interferes with the normal operation of the filter fields of septic tanks. Septic tanks do perform satisfactorily if they are used in summer camps or for other seasonal uses.

BUILDING SITE GROUP 9

This group consists of deep Albrights, Lawrenceville, Duncannon, Watson, Wellsboro, and Wiltshire soils. These soils have slopes ranging from 8 to 15 percent. Except for the Duncannon soil, these soils are moderately well drained and have a seasonally high water table.

community development—Continued

Degree and kind of limitation for—Continued					
Landscaping and lawns	Streets and parking lots	Athletic fields	Parks and play areas	Sanitary land fill (area)	Cemeteries
Moderate: slopes	Severe: slopes	Severe: slopes	Slight	Severe: seasonally high water table.	Severe: seasonally high water table.
Slight	Moderate or severe: slopes.	Moderate: slopes; channery surface.	Moderate: slopes	Slight	Slight.
Moderate: slopes	Severe: slopes	Severe: slopes	Moderate: slopes	Slight	Moderate: slopes.
Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes.
Slight	Moderate or severe: slopes.	Severe: stoniness	Slight	Moderate: seasonally high water table; stoniness.	Severe: seasonally high water table.
Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.

The Duncannon soil is well drained. Most of the soils are moderately eroded, and some of them are channery.

The soils in this group generally provide good foundations for houses, but drainage and sealing of basements may be required. To reach a solid foundation in the Lawrenceville and Duncannon soils, deep excavations are needed in most places. Seepage through the subsoil interferes with the normal operations of septic tank filter fields. If there is much effluent, it may come to the surface farther down the slope.

BUILDING SITE GROUP 10

The soils in this group are poorly drained and somewhat poorly drained, have slopes of 0 to 15 percent, and occur in upland areas. They are in the Allis, Alvira, Atherton, Lickdale, Morris, Ravenna, Shelmadine, and Zipp series. Some of these soils are moderately eroded, some are shaly, some are very stony, and some are channery.

The water table of most of the soils in this group is high for several months of the year, and that of the Lickdale and Atherton soils is high nearly all the year. Sometimes water stands on the surface of the Lickdale and Atherton soils. If community development is planned on the soils of this group, fill is needed to raise foundations above the water table. The fill should be adequately drained so as to prevent the water from rising to a new level. These soils are not suitable for use as filter fields of septic tanks, because the distribution lines would be below the normal water table.

BUILDING SITE GROUP 11

In this group are Mucky peat and Barbour, Basher, Holly, Middlebury, Papakating, and Tioga soils. They are on flood plains that are likely to be flooded by high waters from streams.

The soils in this group may be flooded two or three times a year, or only once in several years. They are poorly suited as sites for buildings, but they can be used for farming, as parks, and as recreational areas.

Descriptions of the Soils

This section describes the soil series (groups of soils) and single soils (mapping units) of Columbia County. The acreage and proportionate extent of each mapping unit are given in table 8.

The procedure in this section is first to describe the soil series, and then the mapping units in the series. Thus, to get full information on any one mapping unit, it is necessary to read the description of that unit and also the description of the soil series to which it belongs. As mentioned in the section "How This Survey Was Made," not all mapping units are members of soil series. Mine dumps and Strip mine spoil are miscellaneous land types and do not belong to a soil series, but, nevertheless, are listed in alphabetic order along with the soil series.

Following the name of each mapping unit, there is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit are the capability unit, the woodland suitability group, and the building site group in which the mapping unit has been placed. The page numbers showing where each of these interpretative groups are described can be found by referring to the "Guide to Mapping Units" at the back of the report.

Soil scientists, engineers, students, and others who want detailed descriptions of the soil series should turn to the section "Formation and Classification of Soils." Many terms in the soil descriptions and in other parts of the report are defined in the Glossary.

TABLE 8.—*Approximate acreage and proportionate extent of soils*

Soil	Acres	Percent	Soil	Acres	Percent
Albrights gravelly silt loam, 0 to 3 percent slopes	265	0.1	Hartleton channery silt loam, 12 to 20 percent slopes, severely eroded	2,455	0.8
Albrights gravelly silt loam, 3 to 8 percent slopes, moderately eroded	3,579	1.2	Hartleton channery silt loam, 20 to 35 percent slopes, moderately eroded	3,408	1.1
Albrights gravelly silt loam, 8 to 15 percent slopes	560	.2	Hartleton channery silt loam, 20 to 35 percent slopes, severely eroded	2,586	.8
Allenwood silt loam, 0 to 3 percent slopes	283	.1	Hartleton very stony silt loam, 0 to 12 percent slopes	338	.1
Allenwood silt loam, 3 to 12 percent slopes, moderately eroded	2,617	.8	Hartleton very stony silt loam, 12 to 35 percent slopes	278	.1
Allenwood silt loam, 12 to 20 percent slopes, moderately eroded	218	.1	Holly silt loam	2,529	.8
Allis silt loam, neutral substratum, 3 to 8 percent slopes, moderately eroded	647	.2	Klinesville shaly silt loam, 3 to 12 percent slopes, moderately eroded	4,567	1.5
Alvira silt loam, 0 to 3 percent slopes	369	.1	Klinesville shaly silt loam, 12 to 20 percent slopes, moderately eroded	1,964	.6
Alvira silt loam, 3 to 8 percent slopes	173	.1	Klinesville shaly silt loam, 12 to 20 percent slopes, severely eroded	1,150	.4
Alvira shaly silt loam, 3 to 8 percent slopes, moderately eroded	1,813	.6	Klinesville shaly silt loam, 20 to 35 percent slopes, moderately eroded	1,543	.5
Alvira shaly silt loam, 8 to 15 percent slopes, moderately eroded	477	.2	Klinesville shaly silt loam, 20 to 35 percent slopes, severely eroded	2,432	.8
Atherton loam	636	.2	Klinesville and Leck Kill shaly silt loams, 35 to 70 percent slopes	2,628	.8
Barbour fine sandy loam	1,109	.4	Klinesville and Leck Kill very stony silt loams, 0 to 12 percent slopes	292	.1
Barbour gravelly loam	1,374	.4	Klinesville and Leck Kill very stony silt loams, 12 to 35 percent slopes	2,023	.7
Barbour silt loam	1,154	.4	Klinesville and Leck Kill very stony silt loams, 35 to 100 percent slopes	2,863	.9
Basher fine sandy loam	744	.2	Lackawanna channery loam, 3 to 12 percent slopes, moderately eroded	1,279	.4
Belmont silt loam, 3 to 12 percent slopes, moderately eroded	1,748	.6	Lackawanna channery loam, 12 to 20 percent slopes, moderately eroded	486	.2
Belmont silt loam, 12 to 20 percent slopes, moderately eroded	345	.1	Lackawanna channery loam, 20 to 35 percent slopes, moderately eroded	134	([1])
Berks shaly silt loam, 3 to 12 percent slopes, moderately eroded	4,042	1.3	Lackawanna very stony loam, 0 to 12 percent slopes	2,676	.9
Berks shaly silt loam, 12 to 20 percent slopes, moderately eroded	1,303	.4	Lackawanna very stony loam, 12 to 35 percent slopes	2,377	.8
Braceville loam, 0 to 3 percent slopes	852	.3	Lackawanna and Oquaga very stony soils, 35 to 100 percent slopes	2,086	.7
Braceville loam, 3 to 8 percent slopes	292	.1	Laidig gravelly loam, 3 to 12 percent slopes, moderately eroded	247	.1
Buchanan cobbly loam, 3 to 8 percent slopes	458	.1	Laidig gravelly loam, 12 to 20 percent slopes, moderately eroded	212	.1
Buchanan very stony loam, 0 to 8 percent slopes	1,764	.6	Laidig very stony loam, 0 to 12 percent slopes	1,556	.5
Calvin shaly silt loam, neutral substratum, 3 to 12 percent slopes, moderately eroded	644	.2	Laidig very stony loam, 12 to 35 percent slopes	614	.2
Calvin shaly silt loam, neutral substratum, 12 to 20 percent slopes, moderately eroded	458	.1	Lawrenceville and Duncannon silt loams, 3 to 8 percent slopes	2,215	.7
Calvin and Klinesville soils, neutral substrata, 20 to 35 percent slopes, moderately eroded	329	.1	Lawrenceville and Duncannon silt loams, 8 to 12 percent slopes, moderately eroded	463	.1
Calvin and Klinesville soils, neutral substrata, 35 to 50 percent slopes, moderately eroded	199	.1	Leck Kill channery silt loam, 0 to 3 percent slopes	356	.1
Canfield channery silt loam, 3 to 8 percent slopes, moderately eroded	2,109	.7	Leck Kill channery silt loam, 3 to 12 percent slopes, moderately eroded	14,115	4.6
Chenango gravelly sandy loam, 0 to 3 percent slopes	3,482	1.1	Leck Kill channery silt loam, 12 to 20 percent slopes, moderately eroded	4,026	1.3
Chenango gravelly sandy loam, 3 to 12 percent slopes, moderately eroded	962	.3	Leck Kill channery silt loam, 12 to 20 percent slopes, severely eroded	1,217	.4
Chenango gravelly sandy loam, 12 to 20 percent slopes, moderately eroded	282	.1	Leck Kill channery silt loam, 20 to 35 percent slopes, moderately eroded	1,020	.3
Chenango gravelly sandy loam, 20 to 35 percent slopes, severely eroded	164	.1	Leck Kill channery silt loam, 20 to 35 percent slopes, severely eroded	773	.2
Chenango silt loam, 0 to 3 percent slopes	1,811	.6	Leck Kill channery silt loam, deep, 0 to 3 percent slopes	551	.2
Chenango silt loam, 3 to 12 percent slopes, moderately eroded	1,083	.3	Leck Kill channery silt loam, deep, 3 to 12 percent slopes, moderately eroded	1,249	3.6
Dekalb channery loam, 3 to 12 percent slopes, moderately eroded	474	.2	Leck Kill channery silt loam, deep, 12 to 20 percent slopes, moderately eroded	1,524	.5
Dekalb channery loam, 12 to 20 percent slopes, moderately eroded	202	.1	Leck Kill channery silt loam, deep, 12 to 20 percent slopes, severly eroded	728	.2
Dekalb very stony loam, 0 to 12 percent slopes	4,600	1.5	Leck Kill very stony silt loam, deep, 0 to 12 percent slopes	3,077	1.0
Dekalb very stony loam, 12 to 35 percent slopes	14,125	4.6			
Dekalb very stony loam, 35 to 100 percent slopes	9,017	2.9			
Edgemont very stony loam, 0 to 12 percent slopes	2,100	.7			
Edgemont very stony loam, 12 to 35 percent slopes	721	.2			
Hartleton channery silt loam, 0 to 3 percent slopes	436	.1			
Hartleton channery silt loam, 3 to 12 percent slopes, moderately eroded	26,073	8.4			
Hartleton channery silt loam, 12 to 20 percent slopes, moderately eroded	10,826	3.5			

See footnote at end of table.

TABLE 8.—*Approximate acreage and proportionate extent of soils*

Soil	Acres	Percent
Leck Kill very stony silt loam, deep, 12 to 35 percent slopes	5, 635	1. 8
Leck Kill very stony silt loam, deep, 35 to 60 percent slopes	3, 977	1. 3
Lickdale silt loam	447	. 1
Lickdale very stony silt loam	263	. 1
Litz silt loam, 3 to 12 percent slopes, moderately eroded	2, 082	. 7
Litz silt loam, 12 to 20 percent slopes, moderately eroded	571	. 2
Litz and Weikert shaly silt loams, 12 to 20 percent slopes, severely eroded	312	. 1
Litz and Weikert shaly silt loams, 20 to 35 percent slopes, severely eroded	745	. 2
Litz and Weikert shaly silt loams, 35 to 50 percent slopes, moderately eroded	614	. 2
Lordstown channery silt loam, 3 to 12 percent slopes, moderately eroded	3, 457	1. 1
Lordstown channery silt loam, 12 to 20 percent slopes, moderately eroded	2, 393	. 8
Lordstown channery silt loam, 20 to 35 percent slopes, moderately eroded	1, 460	. 5
Lordstown very stony silt loam, 0 to 12 percent slopes	827	. 3
Lordstown very stony silt loam, 12 to 35 percent slopes	1, 603	. 5
Lordstown very stony silt loam, 35 to 100 percent slopes	2, 777	. 9
Made land	480	. 2
Middlebury fine sandy loam	805	. 3
Middlebury silt loam	3, 251	1. 0
Mine dumps	446	. 1
Morris channery silt loam, 3 to 8 percent slopes	237	. 1
Morris very stony silt loam, 0 to 8 percent slopes	234	. 1
Mucky peat	182	. 1
Oquaga channery silt loam, 3 to 12 percent slopes, moderately eroded	1, 587	. 5
Oquaga channery silt loam, 12 to 20 percent slopes, moderately eroded	1, 057	. 3
Oquaga channery silt loam, 20 to 35 percent slopes, moderately eroded	475	. 2
Oquaga very stony silt loam, 0 to 12 percent slopes	646	. 2
Oquaga very stony silt loam, 12 to 35 percent slopes	1, 935	. 6
Papakating silty clay loam	765	. 2
Pekin silt loam, cobbly variant, 0 to 3 percent slopes	412	. 1
Pekin silt loam, cobbly variant, 3 to 8 percent slopes, moderately eroded	272	. 1
Ravenna channery silt loam, 0 to 3 percent slopes	260	. 1
Ravenna channery silt loam, 3 to 8 percent slopes	868	. 3
Riverwash	375	. 1
Shelmadine silt loam, 0 to 3 percent slopes	1, 194	. 4
Shelmadine silt loam, 3 to 8 percent slopes, moderately eroded	4, 491	1. 4
Shelmadine very stony silt loam	1, 291	. 4
Steep very stony land	275	. 1
Strip mine spoil	3, 786	1. 2
Tioga fine sandy loam	689	. 2
Tioga gravelly loam	57	(1)
Tioga silt loam	1, 601	. 5
Tioga silt loam, high bottom	387	. 1
Washington silt loam, 0 to 3 percent slopes	105	(1)
Washington silt loam, 3 to 12 percent slopes, moderately eroded	1, 319	. 4
Washington silt loam, 12 to 20 percent slopes, moderately eroded	314	. 1
Watson silt loam, 0 to 3 percent slopes	424	. 1
Watson silt loam, 3 to 8 percent slopes, moderately eroded	5, 094	1. 6
Watson silt loam, 8 to 15 percent slopes, moderately eroded	1, 095	. 4
Weikert channery silt loam, 3 to 12 percent slopes, moderately eroded	9, 347	3. 0
Weikert channery silt loam, 12 to 20 percent slopes, moderately eroded	9, 127	2. 9
Weikert channery silt loam, 20 to 35 percent slopes, moderately eroded	15, 635	5. 0
Weikert channery silt loam, 35 to 80 percent slopes, moderately eroded	9, 026	2. 9
Weikert very stony silt loam, 12 to 35 percent slopes	329	. 1
Weikert very stony silt loam, 35 to 80 percent slopes	2, 137	. 7
Wellsboro channery silt loam, 3 to 8 percent slopes, moderately eroded	672	. 2
Wellsboro channery silt loam, 8 to 15 percent slopes, moderately eroded	89	(1)
Wellsboro very stony silt loam, 0 to 8 percent slopes	87	(1)
Westmoreland silt loam, 3 to 12 percent slopes, moderately eroded	383	. 1
Westmoreland silt loam, 12 to 20 percent slopes, moderately eroded	202	. 1
Wiltshire silt loam, 0 to 3 percent slopes	260	. 1
Wiltshire silt loam, 3 to 8 percent slopes, moderately eroded	1, 574	. 5
Wiltshire silt loam, 8 to 15 percent slopes, moderately eroded	188	. 1
Wooster channery silt loam, 3 to 12 percent slopes, moderately eroded	2, 858	. 9
Wooster channery silt loam, 12 to 20 percent slopes, moderately eroded	1, 056	. 3
Wooster channery silt loam, 20 to 35 percent slopes, moderately eroded	290	. 1
Wooster very stony silt loam, 12 to 35 percent slopes	572	. 2
Wooster and Canfield very stony loams, 0 to 12 percent slopes	684	. 2
Zipp silt loam	551	. 2
Mines and pits	165	. 1
Total	309, 760	100. 0

[1] Less than 0.05 percent.

Albrights Series

The Albrights series consists of deep, moderately well drained or somewhat poorly drained, reddish-brown soils that formed from glaciated red shale and sandstone on nearly level to moderately sloping till plains. These soils are along Roaring Creek, Catawissa Creek, and Fishing Creek.

A typical gently sloping Albrights soil has a reddish-brown gravelly silt loam plow layer 7 inches thick. This layer is slightly sticky but is not difficult to till. The pieces of gravel are generally less than 1 inch across. The subsoil is yellowish-red gravelly silty clay loam that contains a little more gravel than the plow layer. It is firm and sticky, but roots penetrate readily to a compact layer at about 20 inches. Below this depth the subsoil is very firm and mottled. The substratum, beginning at a depth below 30 inches, consists of gravel and mottled silty clay loam in about equal parts. It is very strongly acid. Bedrock occurs at a depth of several feet.

The surface layer is generally gravelly silt loam, but the gravel is made up of small pebbles that, except in cultivated fields, are not likely to be noticed. Depth to the compact layer ranges from about 14 to 30 inches, and depth to the substratum ranges from 30 to 40 inches.

The Albrights soils formed from the same kind of glacial material as the moderately deep, well-drained Leck Kill soils and commonly are in the same fields with them.

Albrights soils are strongly acid where they have not been limed. Permeability is moderately slow, and moisture-holding capacity is moderate to high. Crops respond well to additions of lime and fertilizer. These soils are suited to the shallow-rooted crops commonly grown in the county.

Albrights gravelly silt loam, 0 to 3 percent slopes (AaA).—This nearly level soil is deeper than the soil described as typical of the Albrights series, for it has received deposits from higher areas. In most places the surface layer extends a few inches below the plow layer. A cropping system that lasts 5 years and includes 1 year of hay can be used. This soil can be farmed on the contour, but graded strips improve drainage. Lime and fertilizer are needed for satisfactory yields. (Capability unit IIw-2; woodland group 10; building site group 8)

Albrights gravelly silt loam, 3 to 8 percent slopes, moderately eroded (AaB2).—This is the soil described as typical of the Albrights series. Crops should be grown in graded strips in a 5-year cropping system that provides 2 years of hay. Diversion terraces should be used to intercept runoff and to protect the soil from erosion. Random closed drains may be needed for draining wet spots. Lime and fertilizer are needed to maintain production. (Capability unit IIe-3; woodland group 10; building site group 8)

Albrights gravelly silt loam, 8 to 15 percent slopes (AaC).—Nearly all of this strongly sloping soil is in pasture, but the plow layer resulting from former tillage is still evident. Included in the mapping are some small moderately eroded areas.

Crops should be grown in graded strips in a cropping system that lasts 4 years and provides at least 2 years of hay. A permanent sod cover is needed in natural drainageways. Norway spruce, European larch, and white pine are suitable for planting where woodland is desired. (Capability unit IIIe-2; woodland group 10; building site group 9)

Allenwood Series

The Allenwood series consists of deep, well-drained soils formed in glacial till that was derived from acid sandstone and shale. These soils occupy nearly level to moderately sloping uplands in the north-central part of the county.

A soil typical of the Allenwood series has a silt loam plow layer that is 8 inches thick and contains a few or many fragments of shale. This layer is easily crumbled and is easily tilled. The subsoil, to a depth of about 60 inches, is silty clay loam that contains about the same amount of shale as the plow layer (fig. 2). It is brown in the upper part and yellowish brown at a depth of about 20 inches. The subsoil is sticky when wet. The substratum is generally reddish brown. About 50 per-

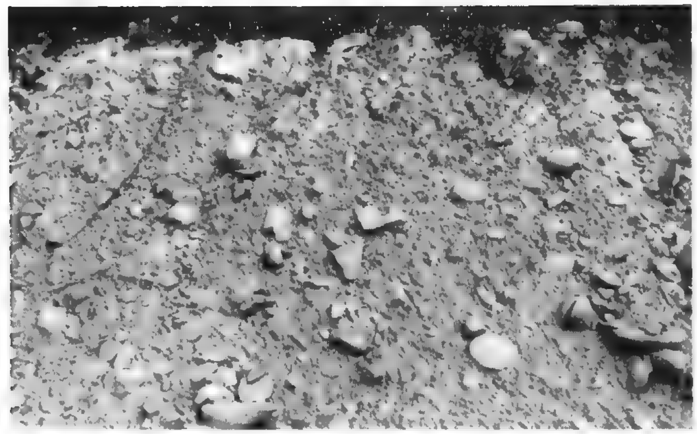

Figure 2.—**Profile of Allenwood silt loam showing gravel and fragments of shale in the subsoil.**

cent of the substratum is coarse fragments of sandstone that have dark coatings of iron and manganese. Bedrock of sandstone or shale is generally at a depth of 6 feet or more.

The Allenwood soils formed from the same kind of glacial material as the moderately deep, well drained Hartleton soils and the moderately well drained Watson soils and commonly are in the same fields with them.

Allenwood soils are strongly acid where they have not been limed. Permeability is moderate, and moisture-holding capacity is high. Crops respond well to additions of lime and fertilizer. These soils are well suited to the crops commonly grown in the county.

Allenwood silt loam, 0 to 3 percent slopes (AeA).—This is the soil described as typical of the Allenwood series. In some places lenses of mottled soil material occur below a depth of 30 inches. This soil is the deepest Allenwood soil in the county, for it is only slightly eroded and in some areas has received deposits from higher areas.

Row crops can be grown continuously if cover crops are planted, if contour tillage is used, and if lime and fertilizer are added. (Capability unit I-1; woodland group 5; building site group 1)

Allenwood silt loam, 3 to 12 percent slopes, moderately eroded (AeB2).—This moderately eroded soil is steeper than the soil described for the series, and it has lost part of its original surface soil. Also, the present plow layer is finer textured, for material from the subsoil has been mixed into it.

Crops on this soil can be grown in a 4-year cropping system that provides 1 year of hay, if contour strips are used and appropriate amounts of lime and fertilizer are added. Diversion terraces are needed on some of the long slopes to intercept runoff and to protect the soil from erosion during heavy rains. (Capability unit IIe-1; woodland group 5; building site group 1)

Allenwood silt loam, 12 to 20 percent slopes, moderately eroded (AeC2).—This moderately eroded soil is steeper and shallower than the soil described as typical of the series. It has a slightly finer textured surface layer because erosion has removed part of the original surface soil and material from the subsoil has been mixed into the plow layer. In some places the subsoil is very compact and contains a considerable amount of gravel. Included in mapping are small severely eroded areas.

A cropping system that provides 2 years of hay in every 5 years can be used if this soil is farmed in contour strips and appropriate amounts of lime and fertilizer are added. Diversion terraces are needed on long slopes to intercept runoff and to protect the soil from erosion. (Capability unit IIIe-1; woodland group 5; building site group 2)

Allis Series

The Allis series consists of shallow to moderately deep, somewhat poorly drained and poorly drained soils formed in material that was derived from dark calcareous shale. These soils are on nearly level and gently sloping till plains in the west-central part of the county.

A soil typical of the Allis series has a brownish-gray silt loam plow layer 6 inches thick. This layer is easily tilled when it is dry, but it is wet much of the year. The subsoil, to a depth of about 20 inches, is pale-yellow, mottled silty clay loam containing chips of shale that gradually increases in amount with depth. Because this layer is sticky, deep tillage is difficult. The substratum is very dark gray shale that contains some clay in the upper part. Although shale from deep cuts contains some lime, these soils are acid.

The subsoil is silty clay loam or silty clay. Depth to mottling ranges from 6 to 12 inches, and depth to shale ranges from 14 to 24 inches. The shale is harder and more alkaline as depth increases.

The Allis soils formed from the same kind of shale as the deep, well drained Westmoreland soils and the moderately well drained Wiltshire soils and commonly occur in the same fields with them.

These soils have moderately slow permeability and moderate moisture-holding capacity. They are strongly acid in unlimed areas, but they are high in natural fertility. Shallow-rooted crops grow well on these soils.

Allis silt loam, neutral substratum, 3 to 8 percent slopes, moderately eroded (AnB2).—This is the soil described as typical of the Allis series. Included in the mapping are small areas of a similar but deeper soil.

This soil is suited to hay or trees. Hay should be seeded in graded strips. A system of open drains and bedding increases production and makes this soil easier to work. Trees suitable for planting are white spruce, European larch, and hemlock. Installing closed drains is impaired by the shale that commonly is near the surface. (Capability unit IVw-1; woodland group 18; building site group 10)

Alvira Series

The Alvira series consists of deep, somewhat poorly drained soils formed in glacial till that was derived mostly from acid sandstone and shale. These soils are in areas of gently sloping and moderately sloping uplands, mainly in the north-central part of the county.

A soil typical of the Alvira series has a dark grayish-brown shaly silt loam plow layer that is 10 inches thick and contains many fragments of shale and many small pieces of sandstone. This layer is easily crumbled and is easily tilled when it is reasonably dry. The upper subsoil is yellowish-brown silty clay loam that contains a few more coarse fragments than the plow layer. Brownish-gray mottles commonly occur at a depth of about 15 inches and increase in number with increasing depth. The subsoil is strongly acid and is sticky and slightly plastic when wet. The lower subsoil is strong-brown silt loam or shaly silt loam mottled with dark brown, yellowish brown, and gray. Coarse fragments of shale and sandstone make up 20 to 40 percent of this layer, by volume. The lower subsoil contains a dense, compact layer that slows the movement of water. It is slightly sticky, slightly plastic, and very strongly acid. Depth to bedrock is more than 5 feet.

The surface layer is silt loam or shaly silt loam, and the subsoil is silty clay loam or silty clay. Coarse fragments in the subsoil range from few to many. The mottles vary in number, size, and color.

The Alvira soils formed from the same kind of glacial sandstone and shale as the moderately well drained Watson soils and the poorly drained Shelmadine soils and commonly are in the same fields with them.

These soils are strongly acid where they have not been limed. They have moderately slow to slow permeability and moderate moisture-holding capacity. Crops respond fairly well to additions of lime and fertilizer, but these soils are not suited to deep-rooted crops or to winter crops.

Alvira silt loam, 0 to 3 percent slopes (ArA).—This nearly level soil is deeper than the soil described as typical of the Alvira series, for it has received deposits from higher areas. It contains fewer coarse fragments and is less acid. In many places the surface layer extends below plow depth. Included in the mapping are small areas of silty clay loam.

A cropping system that provides 2 years of hay in every 4 years can be used if the crops are planted in graded strips, if drainage terraces are used, or both. Closed drains are not very effective, because water moves slowly through the subsoil. (Capability unit IIIw-1; woodland group 14; building site group 10)

Alvira silt loam, 3 to 8 percent slopes (ArB).—This soil has a thicker surface layer than the soil described as typical of the Alvira series. Also, it contains a smaller amount of coarse fragments and is less acid.

A cropping system that provides 1 year of hay in every 3 years can be used if crops are planted in graded strips, if drainage terraces are used, or both. In some places diversion terraces are needed to intercept runoff from higher areas. Random closed drains may be useful in a few places. (Capability unit IIIw-1; woodland group 14; building site group 10)

Alvira shaly silt loam, 3 to 8 percent slopes, moderately eroded (AsB2).—This is the soil described as typical of the Alvira series. Included in mapping are small areas having slopes of less than 3 percent.

A cropping system in which hay is grown every third year can be used if crops are planted in graded strips, if drainage terraces are used, and if lime and fertilizer are added in appropriate amounts. In some places diversion terraces are needed to intercept runoff from higher areas. Random closed drains can be used in some places, but they generally are not effective, because water moves slowly through this soil. (Capability unit IIIw-1; woodland group 14; building site group 10)

Alvira shaly silt loam, 8 to 15 percent slopes, moderately eroded (AsC2).—This moderately eroded soil is steeper than the soil described as typical of the Alvira series, and

in many places it has a finer textured plow layer because material from the subsoil has been mixed into it. Included in the mapping are small severely eroded areas.

A cropping system that provides 2 years of hay in every 4 years can be used on this soil if crops are planted in graded strips and a good program of liming and fertilizing is followed. The slopes generally are not long enough to require the use of diversion terraces. (Capability unit IIIe–2; woodland group 14; building site group 10)

Atherton Series

The Atherton series consists of moderately deep and deep, very poorly drained to somewhat poorly drained soils that formed in outwash of sand and gravel on nearly level glacial terraces. These soils occur mostly along the Susquehanna River.

A typical Atherton soil has a surface layer consisting of dark-gray loam that is mottled and streaked with rust along root channels. This layer is about 14 inches thick. It is generally waterlogged and is too wet to till unless it is drained. The subsoil is mottled, gray fine sandy loam. It extends to a depth of about 28 inches and is constantly waterlogged unless it is drained. The substratum is made up of several inches of mottled, gray sandy clay that overlies stratified sand and gravel.

Mottling may begin at any depth between the surface and a depth of about 14 inches. Depth to the substratum ranges from 26 to 40 inches, and depth to bedrock ranges from about 6 to 40 feet.

The Atherton soils formed from the same kind of glacial outwash as the moderately well drained Braceville soils and commonly are adjacent to them.

These soils are strongly acid in unlimed areas. They have moderate to slow permeability and moderate moisture-holding capacity. Unless they are drained, these soils are too wet for tillage. They are fairly easy to drain where outlets are available.

Atherton loam (0 to 3 percent slopes) (At).—This is the soil described as typical of the Atherton series, and it is the only Atherton soil mapped in Columbia County. If a system of bedding and closed drains is used to improve surface drainage and to lower the water table, a suitable cropping sequence is a row crop, a small grain, and hay. Areas where outlets for drainage are not available are good wildlife habitat. Silky cornel, highbush cranberry, and purple-osier willow provide food and cover for wildlife. (Capability unit IIIw–2; woodland group 23; building site group 10)

Barbour Series

The Barbour series consists of deep, well-drained soils formed in sand, silt, and clay recently deposited on nearly level and gently sloping flood plains. These soils occur principally along upper Fishing Creek.

A typical Barbour soil has a reddish-brown silt loam plow layer 10 inches thick. This layer is loose, easily crumbled, and easily tilled. The subsoil is reddish-brown loam that generally contains a considerable amount of gravel. It is loose and porous and is easily penetrated by roots and water. To a depth of 10 feet or more, the substratum is reddish-brown sand and gravel. It is uniform throughout, except for the presence of large pieces of gravel and some cobbles.

The surface layer is silt loam, fine sandy loam, or gravelly loam. The subsoil varies considerable in texture and in the amount of gravel that it contains. The color of these soils is practically uniform throughout the profile.

Barbour soils commonly occur in the same fields as do the moderately well drained or somewhat poorly drained Basher soils and formed from similar kinds of material.

Although these soils are on flood plains, they are seldom flooded. They have rapid permeability and high moisture-holding capacity. Crops respond well to additions of lime and fertilizer. These soils are well suited to the crops commonly grown in the county.

Barbour fine sandy loam (0 to 5 percent slopes) (Ba).—This soil is not so fine textured as the soil described for the Barbour series, but it is like that soil in other respects. It is flooded occasionally for short periods early in spring, but the soil dries out readily, and crops can be grown with little risk of damage by water.

This soil is well suited to row crops and deep-rooted grasses and legumes. It is well suited to truck crops, though only a little of it is used for them. Row crops can be grown continuously if a cover crop is seeded after the row crop is harvested, if the organic-matter content is maintained, and if fertilizer and lime are added in appropriate amounts. Water for irrigation is generally available from nearby streams. (Capability unit I–2; woodland group 1; building site group 11)

Barbour gravelly loam (0 to 3 percent slopes) (Bb).—This soil is mostly in old stream channels and scoured areas on the flood plains. Gravel makes up more than 15 percent of the plow layer. Permeability is more rapid in this soil than in Barbour silt loam and Barbour fine sandy loam. Flooding causes little damage, because it occurs infrequently and lasts only for short periods.

Row crops can be grown continuously if cover crops are seeded, if a good program of liming and fertilization is followed, and if the organic-matter content is maintained (fig. 3). This soil is well suited to deep-rooted grasses and legumes, and in many places truck crops can be grown. Water for irrigation is generally available from nearby streams. (Capability unit I–2; woodland group 1; building site group 11)

Barbour silt loam (0 to 3 percent slopes) (Bc).—This is the soil described as typical of the Barbour series. Row crops can be grown continuously if a cover crop is seeded, if the content of organic matter is maintained, and if a good program of liming and fertilization is followed. (Capability unit I–2; woodland group 1; building site group 11)

Basher Series

The Basher series consists of deep, moderately well drained and somewhat poorly drained soils that formed in recent deposits of sand, silt, and clay on nearly level flood plains. These soils are principally along the upper part of Fishing Creek.

A typical cultivated Basher soil has a reddish-brown fine sandy loam plow layer about 9 inches thick. This layer is loose, easily crumbled, and easily tilled. The

Figure 3.—In the foreground are potatoes on Barbour gravelly loam. In the middle ground is Oquaga channery silt loam in grass. Lordstown very stony silt loam is in the forested area in the extreme background.

subsoil, to a depth of about 20 inches, is reddish-brown fine sandy loam that contains some gravel. It is loose and porous and is easily penetrated by roots and water. The substratum is compact, red sandy loam that contains some gravel. Impeded drainage is indicated by many, fine, faint, generally pale-red mottles. Depth to the substratum ranges from about 15 to 30 inches.

The Basher soils formed in material similar to that in which the well-drained Barbour soils formed and commonly occur in the same fields with them.

These soils have rapid permeability to a depth of about 20 inches and moderate permeability below that depth. They have moderately high moisture-holding capacity. Crops respond well to additions of lime and fertilizer. Although these soils are on flood plains, they are seldom flooded. They are fairly well suited to most crops commonly grown in the county.

Basher fine sandy loam (0 to 3 percent slopes) (Bd).—This is the only Basher soil mapped in Columbia County, but small areas of silt loam are included in the mapped areas. If the organic-matter content is maintained, and appropriate amounts of lime and fertilizer are added, a cropping system that lasts 5 years and includes 1 year of hay can be used. Random closed drains may be needed for draining wet spots. This soil is occasionally flooded early in spring, but the floodwaters cause little damage. (Capability unit IIw–1; woodland group 2; building site group 11)

Belmont Series

The Belmont series consists of deep, well-drained soils that formed from calcareous red shale on gentle and moderate slopes. These soils occur as a band that extends from east to west and is adjacent to the limestone soils north of the terraces along the Susquehanna River.

A soil typical of the Belmont series has a light reddish-brown silt loam plow layer that is 6 inches thick and contains a few fragments of shale. This layer is easily crumbled and easily tilled. The subsoil, to a depth of about 40 inches, is red shaly silty clay loam or shaly silty clay. Chips of shale make up as much as 40 percent of the soil mass. The subsoil is sticky, but it does not seriously restrict the movement of water or the growth of roots. The substratum consists of about 10 inches of dusky red shaly sandy clay loam over hard, red, calcareous shale. It is slightly acid or neutral.

In many places the surface is covered by a thin mantle of windblown silt that makes up the entire plow layer. Depth to the substratum ranges from 3 to 4 feet, and depth to hard bedrock ranges from 4 to 8 feet.

The Belmont soils formed from material that is similar to that in which Calvin shaly silt loam, neutral substratum, formed. These soils commonly occur in the same fields.

Unlimed areas of Belmont soils are strongly acid at the surface, though the substratum is nearly neutral. Permeability is moderate, and moisture-holding capacity is high. These soils are well suited to all crops commonly grown in the county. Yields are satisfactory where lime and fertilizer are applied according to the needs of the crop grown.

Belmont silt loam, 3 to 12 percent slopes, moderately eroded (BeB2).—This is the soil described as typical of the Belmont series. If diversion terraces are installed to intercept runoff and management is good, a cropping system that lasts 4 years and includes 1 year of hay can be used. Good management provides contour stripcropping and the seeding of cover crops and green-manure crops to maintain organic-matter content and good tilth. This soil is well suited to all crops commonly grown in the county, and under good management produces satisfactory yields. (Capability unit IIe–1; woodland group 8; building site group 1)

Belmont silt loam, 12 to 20 percent slopes, moderately eroded (BeC2).—This soil is steeper and less deep than

the soil described as typical of the Belmont series. Crops should be grown in contour strips in a cropping system that lasts 4 years and provides at least 2 years of hay. Diversion terraces should be constructed to intercept runoff and to protect the soil from further erosion. Natural drainageways should be kept in a permanent cover of grass. Lime and fertilizer are needed to maintain good forage and for adequate yields. (Capability unit IIIe-1; woodland group 8; building site group 2)

Berks Series

The Berks series consists of moderately deep, well-drained soils that formed from thin beds of dark-colored acid shale. These soils are on gently sloping to strongly sloping till plains, principally in Madison and Greenwood Townships.

A typical cultivated Berks soil has a brown shaly silt loam plow layer that is 6 inches thick and contains about 20 percent shale fragments. This layer is easily crumbled and easily tilled. The subsoil is silty clay loam that is slightly sticky and strongly acid. It is very pale brown in the upper part and is pink in the lower part. Shale chips increase in amount with depth and make up about 30 to 60 percent of the soil mass. The underlying bedrock, beginning at about 24 to 30 inches, is dark-gray to black shale and has some pinkish clay films on its upper surface.

The subsoil is shaly silty clay loam or shaly silt loam that ranges from pale brown to strong brown or pink.

The Berks soils formed from material similar to that of the shallow, well drained Weikert soils, the deep, well drained Allenwood soils, and the moderately well drained and somewhat poorly drained Watson soils. All of these soils commonly occur in the same fields.

The Berks soils are strongly acid in unlimed areas. They have moderately rapid permeability and low moisture-holding capacity. Crops respond well to additions of lime and fertilizer. These soils are suited to most of the crops commonly grown in the county.

Berks shaly silt loam, 3 to 12 percent slopes, moderately eroded (BkB2).—This is the soil described as typical of the Berks series. Included in the mapping are small areas of silt loam.

Crops can be grown in a cropping system that lasts 4 years and provides 2 years of hay if contour strips are used and heavy applications of lime and fertilizer are added. Diversion terraces are needed to break the long slopes and reduce the erosion hazard. (Capability unit IIe-5; woodland group 12; building site group 5)

Berks shaly silt loam, 12 to 20 percent slopes, moderately eroded (BkC2).—This soil is steeper and less deep to hard rock than the soil described as typical of the Berks series. Generally, it is more droughty and contains more chips of shale in the plow layer.

This soil is suited to long-term hay, but the hay should be seeded in contour strips. Row crops can be grown, but yields are low in dry seasons. Satisfactory yields can be obtained if adequate amounts of lime and fertilizer are added. In some places diversion terraces are needed to intercept runoff. In pastures contour furrows slow runoff and help to increase the amount of forage produced. (Capability unit IIIe-3; woodland group 12; building site group 6)

Braceville Series

The Braceville series consists of deep, moderately well drained and somewhat poorly drained soils formed in glacial outwash of sand and gravel that was derived from acid gray sandstone, shale, and erratics. These soils are on nearly level and gently sloping terraces along the Susquehanna River.

A typical Braceville soil has a dark yellowish-brown loam plow layer about 8 inches thick. This layer is loose and, except in very wet periods, is easily tilled. The subsoil is yellowish-brown loam or fine sandy loam that is faintly mottled in the lower part. It is moderately slow in permeability and is easily penetrated by roots. The substratum is stratified sand and gravel that contain some large cobbles.

The surface layer is mostly loam, but in some small areas it is silt loam or fine sandy loam. The subsoil is silt loam or sandy loam. Depth to mottling ranges from 14 to 30 inches, and depth to bedrock generally is more than 30 feet.

Braceville soils formed from the same kind of glacial outwash as the deep, well-drained Chenango soils and commonly are on the same terraces with them.

These soils are strongly acid where they have not been limed. Permeability is moderately slow, and moisture-holding capacity is moderate to high. These soils are suited to the crops commonly grown in the county, though alfalfa does not do so well as on the well-drained soils.

Braceville loam, 0 to 3 percent slopes (BrA).—This is the soil described as typical of the Braceville series. Row crops can be grown continuously if the organic-matter content is maintained at a high level, if cover crops are seeded after the row crop is harvested, and if tillage is on the contour. Heavy applications of lime and fertilizer are needed for adequate yields. The water table can be lowered by installing closed drains. (Capability unit IIw-3; woodland group 7; building site group 8)

Braceville loam, 3 to 8 percent slopes (BrB).—This soil is slightly steeper than the soil described as typical of the series, and it generally is farther from the Susquehanna River. It should be farmed in graded strips. If the organic-matter content is maintained at a high level, a cropping system that provides 2 years of hay in every 5 years can be used. In some places diversion terraces are needed to intercept runoff from higher areas. Heavy applications of lime and fertilizer are needed for satisfactory yields. (Capability unit IIe-3; woodland group 7; building site group 8)

Buchanan Series

The Buchanan series consists of deep, moderately well drained and somewhat poorly drained soils that formed in mixed colluvium in gently sloping areas at the base of steep mountain slopes. These soils occur near the base of most of the mountains in the county.

A soil typical of the Buchanan series has a brown very stony loam or cobbly loam surface layer that is covered with a thin layer of black humus. The surface layer is easily crumbled, but it contains many stones or cobbles that interfere with normal tillage operations. The upper subsoil also contains many stones. It is brown sandy loam to a depth of about 20 inches, where

it grades to sandy clay loam that contains many, fine, faint, pink mottles and many stones. Below this depth the subsoil is firm when moist and sticky when wet. This layer restricts the movement of water and the growth of roots. The substratum is brown very stony clay loam, and has many pink and light-gray mottles.

Many large, blocky stones or cobbles generally occur on the surface, but in some places the cobbles have been removed to permit mowing. The subsoil is loam or sandy loam.

The Buchanan soils formed from the same kind of material as the deep, well-drained Laidig soils and generally occur below them on the same slope.

These soils are strongly acid. Permeability is moderate to a depth of about 20 inches and moderately slow below that depth. The moisture-holding capacity is moderate. Because of the stones and cobbles, these soils are better suited to trees than to crops.

Buchanan cobbly loam, 3 to 8 percent slopes (BuB).—The profile of this soil is similar to the one described for the series. Included in the mapping are a few cultivated areas that are moderately eroded.

Most of the acreage is in trees, but a few areas are in pasture. If the cobbles are removed from the surface and the trees are cleared, this soil can be used for hay or improved pasture; it is suitable for trees, such as white pine, Austrian pine, and European larch. If crops are grown, corn, small grain, and birdsfoot trefoil are most suitable. (Capability unit IVe–2; woodland group 10; building site group 8)

Buchanan very stony loam, 0 to 8 percent slopes (BvB).—This is the soil described as typical of the Buchanan series. Many large blocks of sandstone are on the surface and throughout the profile.

Most of the acreage is wooded, but fair pasture could be produced if the trees were cleared. This soil is suitable as woodland and for wildlife habitat. Trees suitable for planting are white pine, Austrian pine, Scotch pine, and European larch. Silky cornel, multiflora rose, and autumn-olive are suitable shrubs. (Capability unit VIs–3; woodland group 10; building site group 8)

Calvin Series

The Calvin series consists of shallow to moderately deep, well-drained soils that formed from calcareous red shale on gentle to steep slopes in the glaciated uplands. A gravel pit near Bloomsburg exposes some interbedded green shale. These soils are in a belt that extends in an east-west direction next to the soils formed from limestone north of the outwash terraces along the Susquehanna River.

A soil typical of the Calvin series has a reddish-brown shaly silt loam plow layer about 8 inches thick. This layer is easily crumbled and, except in severely eroded areas, is easily tilled. The subsoil, to a depth of about 18 inches, is weak-red shaly silty clay loam that is somewhat sticky but is easily penetrated by roots, air, and water. To a depth of about 32 inches, the substratum is red, shaly, slightly acid silt loam. It is underlain by hard, calcareous red shale (fig. 4).

Depth to the substratum ranges from 12 to 34 inches. In some places the subsoil lies directly on hard shale.

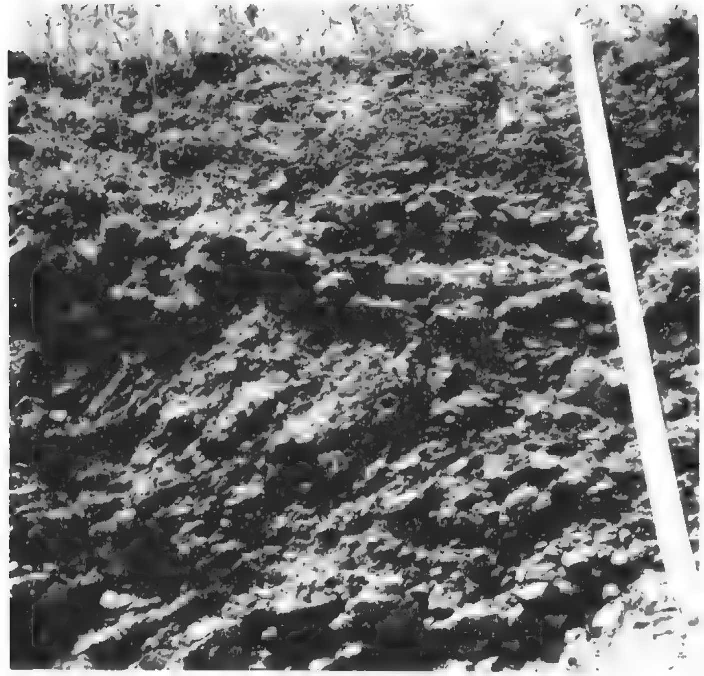

Figure 4.—**Profile of Calvin shaly silt loam showing fractured shale in the substratum.**

Calvin soils formed from the same kind of calcareous red shale as the Belmont soils and commonly occur in the same fields with them.

These soils are strongly acid at the surface in unlimed areas. They have moderately rapid permeability and moderate to low moisture-holding capacity. They are suited to most of the crops commonly grown in the county, but yields are reduced in dry seasons.

Calvin shaly silt loam, neutral substratum, 3 to 12 percent slopes, moderately eroded (CaB2).—This soil is not so steep nor so shallow as the soil described as typical of the Calvin series, but it is like that soil in other respects. Included in the mapping are some uneroded areas.

A row crop, a small grain, and hay can be grown in a cropping system in which contour strips are used. Diversion terraces can be constructed where needed to intercept runoff and protect the soil from erosion. Additions of lime and fertilizer are needed to maintain production. (Capability unit IIe 4; woodland group 12; building site group 5)

Calvin shaly silt loam, neutral substratum, 12 to 20 percent slopes, moderately eroded (CaC2).—This is the soil described as typical of the Calvin series. Crops can be grown on this soil if they are grown in contour strips and the soil is kept covered with grass at least half of the time. Natural drainageways can be protected by a permanent cover of grass. Diversion terraces intercept runoff and help to control erosion. (Capability unit IIIe–4; woodland group 12; building site group 6)

Calvin and Klinesville soils, neutral substrata, 20 to 35 percent slopes, moderately eroded (CbD2).—The Calvin soil and the Klinesville soil in this mapping unit are steeper and shallower than the soils described as typical of their respective series. Both of these soils are shallow, droughty, and poorly suited to row crops. They are suitable for pasture seeded in contour strips. If contour

furrows are used, runoff is retarded and more moisture enters the soil. A good cover of grass can be maintained if pastures are not overgrazed. (Both soils in capability unit IVe–3, woodland group 13, and building site group 6)

Calvin and Klinesville soils, neutral substrata, 35 to 50 percent slopes, moderately eroded (CbE2).—The soils of this mapping unit are steeper and shallower than the soils described as typical of the Calvin and the Klinesville series. Included in mapped areas are small severely eroded areas of both soils.

The soils in this unit are too steep, too shallow, and too droughty to be used as cropland, but they are suitable for pasture on which grazing is limited. By limiting grazing, a cover of grass is maintained. Most areas of this unit are better suited to trees than to pasture. Trees suitable for planting are European larch, black locust, red pine, white pine, and Norway spruce. Food and cover for wildlife can be provided by planting multiflora rose, bayberry, Tatarian honeysuckle, autumn-olive, and silky cornel. (Both soils in capability unit VIIe–1, woodland group 13, and building site group 7)

Canfield Series

The Canfield series consists of deep, moderately well drained and somewhat poorly drained soils formed from Wisconsin glacial till that was derived mostly from acid gray sandstone and shale. These soils are on gently sloping and moderately sloping uplands in the northeastern part of the county.

A typical cultivated Canfield soil has a dark grayish-brown channery silt loam plow layer about 6 inches thick. Varying amounts of shale chips and small stones occur on the surface. The plow layer is easily crumbled, and it is fairly easy to till after it dries in spring. The subsoil is yellowish-brown channery silty clay loam that is easily penetrated by roots and water to a depth of about 24 inches. Below this depth is a thin, firm, distinctly mottled brown layer of channery loam. This layer is sticky, and it restricts the movement of water and the growth of roots. It is underlain by mottled, dark-brown channery sandy loam, of which about 30 to 50 percent is coarse fragments.

Canfield soils formed from the same kind of till as the deep, well-drained Wooster soils and the poorly drained or somewhat poorly drained Ravenna soils and commonly occur in the same fields with those soils.

These soils are very strongly acid in unlimed areas. They have moderate to slow permeability and moderate moisture-holding capacity. Crops respond well to additions of lime and fertilizer. These soils are suited to most of the shallow-rooted crops commonly grown in the county.

Canfield channery silt loam, 3 to 8 percent slopes, moderately eroded (CfB2).—This is the soil described as typical of the Canfield series. Included in mapping are small areas that have slopes of slightly more than 8 percent and small areas that are not channery.

If graded strips are used and a good program of liming and fertilization is followed, crops can be grown in a cropping system that lasts 5 years and provides 2 years of hay. Diversion terraces are needed on long slopes to intercept runoff and reduced erosion. Random closed drains may be needed for draining seeps and other wet areas. (Capability unit IIe–3; woodland group 10; building site group 8)

Chenango Series

The Chenango series consists of deep, well-drained soils that formed in glacial outwash of gravel and sand. This outwash was derived principally from acid gray sandstone, shale, and various erratics. Chenango soils are on nearly level to strongly sloping terraces, mostly along the Susquehanna River.

A typical Chenango soil has a dark-brown gravelly sandy loam plow layer about 9 inches thick. This layer is loose and is easily tilled. In some places the surface layer is platy below the plow layer. The subsoil is dark yellowish-brown gravelly sandy loam that is about half gravel and is easily penetrated by water and roots. The substratum consists mostly of stratified gravel and sand and contains some large cobbles.

The surface layer is silt loam and gravelly sandy loam. In part of the area near Berwick, the surface layer is deeper than that of the soil described and has very little gravel to a depth of 3 feet. The subsoil ranges from gravelly fine sandy loam to gravelly sandy loam. Depth to the substratum ranges from about 20 inches to 50 inches, and depth to bedrock generally is more than 30 feet.

The Chenango soils formed from the same kind of outwash as the deep, moderately well drained and somewhat poorly drained Braceville soils and commonly occur in the same fields with them.

These soils are strongly acid where they have not been limed, though the substratum contains some limy material. They are very permeable and have moderate moisture-holding capacity. They are suited to the crops commonly grown in the county.

Chenango gravelly sandy loam, 0 to 3 percent slopes (CgA).—This soil is more nearly level than the soil described for the Chenango series. In many places it has received some deposits from higher areas. Included in the mapping are small areas of gravelly loam and small areas of sandy loam that contain very little gravel.

If this soil is farmed on the contour and cover crops are seeded, row crops can be grown continuously. Heavy applications of lime and fertilizer are needed for satisfactory yields. (Capability unit IIs–1; woodland group 8; building site group 1)

Chenango gravelly sandy loam, 3 to 12 percent slopes, moderately eroded (CgB2).—This is the soil described as typical of the Chenango series. Row crops can be grown continuously if contour strips are used. Heavy applications of lime and fertilizer are needed for adequate yields. Winter cover crops are needed to maintain the organic-matter content and to control erosion. (Capability unit IIs–1; woodland group 8; building site group 1)

Chenango gravelly sandy loam, 12 to 20 percent slopes, moderately eroded (CgC2).—This strongly sloping soil contains more gravel and less organic matter in the plow layer than the soil described for the series. Crops can be grown in contour strips in a cropping system that lasts 5 years and provides at least 2 years of hay. Diversion terraces may be needed to intercept runoff from higher areas and to protect the soil from erosion. Heavy

applications of lime and fertilizer are needed for satisfactory yields. (Capability unit IIIe-5; woodland group 8; building site group 2)

Chenango gravelly sandy loam, 20 to 35 percent slopes, severely eroded (CgD3).—This soil is in steep areas between the flood plains and the terraces. It contains more gravel than the soil described for the series, and in some places cobbles are on the surface. Most of the original surface soil has been lost through erosion. This soil should be kept in permanent hay or in pasture of birdsfoot trefoil. Reseeding in narrow contour strips is advisable. Satisfactory yields of forage are produced where large amounts of lime and fertilizer are added. (Capability unit IVe-5; woodland group 9; building site group 2)

Chenango silt loam, 0 to 3 percent slopes (ChA).—This soil is finer textured than the soil described for the series, and it contains much less gravel in the plow layer and subsoil. It has the highest moisture-holding capacity of any soil in the Chenango series. Row crops can be grown continuously, if this soil is tilled on the contour and cover crops are seeded after the row crop is harvested. Lime and fertilizer are needed for satisfactory yields. (Capability unit I-1; woodland group 8; building site group 1)

Chenango silt loam, 3 to 12 percent slopes, moderately eroded (ChB2).—This soil is finer textured than the soil described as typical of the Chenango series, and it contains very little gravel in the plow layer. Also, it is not so rapidly permeable, and it has higher moisture-holding capacity.

A cropping system in which hay is seeded every fourth year can be used if the crops are grown in contour strips. A good program of liming and fertilization is needed for satisfactory yields. In some places diversion terraces are needed to intercept runoff from higher areas. (Capability unit IIe-2; woodland group 8; building site group 1)

Dekalb Series

The Dekalb series consists of shallow to deep, well-drained soils that formed principally from sandstone on nearly level to very steep uplands. These soils are on the mountains in the central part of the county.

A soil typical of the Dekalb series has a 9-inch surface layer of brownish-yellow very stony loam that is covered with about 2 inches of decaying organic material consisting mostly of oak leaves. The subsoil is yellowish-brown loam and is similar to the surface layer, but it contains a smaller amount of organic matter. The subsoil is uniform and generally extends to a depth that ranges from 18 inches to several feet. Bedrock is gray sandstone (fig. 5).

The surface layer is very stony loam or channery loam. It ranges from yellowish brown to brownish yellow and strong brown. Depth to bedrock is less than 3 feet in most places. In areas near the Edgemont soils, the Dekalb soils contain considerable quartzite.

The Dekalb soils commonly occur on the mountains above the deep, well drained Laidig soils and the moderately well drained Buchanan soils. They are adjacent to the deep, well-drained Leck Kill and Edgemont soils.

Figure 5.—**Bedrock underlying Dekalb very stony loam. Some roots penetrate into the fractures, and fibrous roots extend along the surface of the rock.**

These soils are strongly acid in unlimed areas. They have rapid permeability and moderately low moisture-holding capacity. Crops respond fairly well to additions of lime and fertilizer. Except for the stony areas, these soils are suited to most of the crops commonly grown in the county.

Dekalb channery loam, 3 to 12 percent slopes, moderately eroded (DaB2).—This soil has a profile similar to the one described as typical of the Dekalb series, but instead of the large stones in the profile and on the surface, there are many small platy fragments of sandstone, less than 6 inches along the longest axis. An organic mat does not occur on the surface, and the plow layer is distinctly separated from the subsoil.

If adequate amounts of lime and fertilizer are added to the soil and crops are seeded in contour strips, a cropping system providing a row crop, a small grain, and hay can be used. Diversion terraces are needed to intercept runoff and to protect the soil from erosion. (Capability unit IIe-4; woodland group 12; building site group 3)

Dekalb channery loam, 12 to 20 percent slopes, moderately eroded (DaC2).—The profile of this soil is similar to the one described as typical of the Dekalb series, but the surface layer does not contain large stones and there is no organic mat.

Crops can be grown in contour strips in a cropping system that provides at least 2 years of hay in every 4 years, but diversion terraces are needed to intercept runoff and to protect the soil from erosion. (Capability unit IIIe-4; woodland group 12; building site group 4)

Dekalb very stony loam, 0 to 12 percent slopes (DkB).—This soil is mostly on broad, nearly flat mountaintops. In some places it contains much more quartzite than the soil described as typical of the Dekalb series. In most places it is shallow and somewhat droughty.

This soil is suitable as woodland, which should be protected from fire. Some areas can be planted to furnish food and cover for wildlife. If some areas were cleared, they could be used for pasture, but some areas are not easily accessible to livestock. (Capability unit VIs–2; woodland group 19; building site group 3)

Dekalb very stony loam, 12 to 35 percent slopes (DkD).—This is the soil described as typical of the Dekalb series. It commonly occurs on the lower slopes of mountains and has received deposits from higher areas. Included in the mapping are pockets of very stony sandy loam, which are generally deeper than are areas of surrounding soils.

Most of the acreage is wooded, for the stones limit the suitability of this soil for other uses. Woodland needs to be protected from fire and grazing. If areas of this soil were cleared, they could produce fair pasture, but clearing generally is not practical. (Capability unit VIs–2; woodland group 19; building site group 4)

Dekalb very stony loam, 35 to 100 percent slopes (DkF).—This very steep soil is the shallowest soil of the Dekalb series in the county. It can be used as woodland, which should be protected from fire. Trees can be planted on this soil to help maintain an even flow of water into the streams that drain watersheds. (Capability unit VIIs–1; woodland group 20; building site group 7)

Duncannon Series

The Duncannon series consists of deep, well-drained, yellowish-brown soils that formed from fine windblown material on gently sloping and moderately sloping uplands. These soils occur in the central part of the county.

Cultivated Duncannon soils typically have a yellowish-brown very fine sandy loam or silt loam plow layer that is about 10 inches thick, and this layer is underlain by about 5 inches of material that is much the same. Duncannon soils are almost free of coarse fragments, crumble very easily, and are easy to till. Their subsoil is yellowish-brown silt loam or loam that contains very few coarse fragments and generally is more than 2 feet thick. It is slightly sticky when wet. In most places the substratum is shale.

Duncannon soils formed from the same kind of material as the moderately well drained Lawrenceville soils and commonly occur in the same fields with them.

Duncannon soils are moderately acid where they are not limed, but crops respond well to additions of lime and fertilizer. These soils have rapid permeability and high moisture-holding capacity, but they are very erodible. They are suited to all of the crops commonly grown in the county.

In this county Duncannon soils are mapped only with Lawrenceville soils in undifferentiated soil groups.

Edgemont Series

The Edgemont series consists of deep, well-drained soils that formed in material weathered from sandstone and quartzite on gentle to strong slopes of mountains. These soils occur in the southern tip of the county in Conyngham Township.

A typical Edgemont soil has a surface layer of yellow very stony loam that is about 12 inches thick and contains some charcoal. Although this layer is loose, it is too stony to till. The subsoil to a depth of more than 3 feet is sandy loam that is generally yellow but has a slight reddish hue in some places. It commonly contains many coarse fragments. The substratum is bedrock of sandstone and conglomerate.

The subsoil ranges from loam to sandy clay loam. In most places these soils are very gritty throughout the profile.

The Edgemont soils are on the mountains above the deep, well drained Laidig soils and the moderately well drained Buchanan soils.

These soils are medium acid and are low in natural fertility. They have moderately rapid permeability and low moisture-holding capacity. These soils are too stony for cultivated crops but are suitable as woodland and for wildlife habitat.

Edgemont very stony loam, 0 to 12 percent slopes (EdB).—This soil is more nearly level and deeper than the soil described as typical of the Edgemont series. It is suitable as woodland and can be used for pasture. Trees suitable for planting are Norway spruce, white pine, Scotch pine, European larch, and red pine. (Capability unit VIs–1; woodland group 8; building site group 3)

Edgemont very stony loam, 12 to 35 percent slopes (EdD).—This is the soil described as typical of the Edgemont series. It is suitable as woodland and can be used for pasture. Trees suitable for planting are Norway spruce, white pine, Scotch pine, European larch, and red pine. Silky cornel, multiflora rose, and lespedeza can be grown to provide food and cover for wildlife. Areas that have a good forest cover provide a natural watershed. (Capability unit VIs–1; woodland group 8; building site group 4)

Hartleton Series

The Hartleton series consists of moderately deep, well-drained soils formed from glacial till that was derived from acid shale and sandstone. These soils occur throughout the county in nearly level to steep areas of the uplands.

A typical Hartleton soil has a grayish-brown channery silt loam plow layer 8 inches thick. The coarse fragments are small chips of shale and larger pieces of sandstone. The plow layer is easily crumbled and easily tilled. The subsoil is yellowish-brown channery silt loam that contains about the same amount of fragments as the plow layer. It is uniform and extends to a depth of about 34 inches. The substratum is about 70 to 80 percent shale fragments that are coated with black. Between the fragments is yellowish-brown silt loam. Hard sandstone occurs at a depth of 40 inches or more.

The surface layer is channery silt loam and very stony silt loam. More clay is in the subsoil than is in the surface layer. In some places the lower subsoil is redder than the upper subsoil. The combined thickness of the surface layer and subsoil ranges from 20 to 35 inches. Depth to bedrock ranges from 30 to 50 inches.

The Hartleton soils formed from the same kind of material as the shallow, well drained Weikert soils, the deep, well drained Allenwood soils, and the moderately

well drained Watson soils. In any field one or more of those soils may occur with the Hartleton soils.

These soils are strongly acid where they have not been limed. They have moderately rapid permeability and moderate moisture-holding capacity. Crops respond well to additions of fertilizer. Except in areas that are steep, severely eroded, or very stony, these soils are suited to the crops commonly grown in the county.

Hartleton channery silt loam, 0 to 3 percent slopes (HhA).—This nearly level soil is deeper than the soil described as typical of the Hartleton series, for in some places it has received deposits from higher areas. Included in the mapping are small areas of a somewhat poorly drained soil.

Row crops can be grown continuously if the soil is farmed on the contour and a cover crop is seeded after the row crop is harvested. Lime and fertilizer are needed for satisfactory yields. (Capability unit IIs–2; woodland group 12; building site group 3)

Hartleton channery silt loam, 3 to 12 percent slopes, moderately eroded (HhB2).—This is the soil described as typical of the Hartleton series. It is suitable for a cropping system in which hay is grown every fourth year and contour strips are used. Diversion terraces are needed to intercept runoff and to protect the soil from erosion. Lime and fertilizer are needed for satisfactory yields. (Capability unit IIe–5; woodland group 12; building site group 3)

Hartleton channery silt loam, 12 to 20 percent slopes, moderately eroded (HhC2).—This soil is steeper and shallower than the soil described for the series. Contour strips are needed to conserve moisture, and diversion terraces are needed to intercept runoff and to protect the soil from erosion. Hay should be grown for at least 3 years in every 5. Natural drainageways can be protected by a permanent cover of grass. (Capability unit IIIe–3; woodland group 12; building site group 4)

Hartleton channery silt loam, 12 to 20 percent slopes, severely eroded (HhC3).—Erosion has removed all or nearly all of the original surface layer from this soil. For protection against erosion, permanent hay or trees are needed. If reseeding is necessary, it should be done in contour strips. Lime and fertilizer should be added as needed. In some places diversion terraces are needed to intercept runoff from higher areas. White pine, Norway spruce, and European larch are suitable for planting where woodland is desired. (Capability unit IVe–1; woodland group 12; building site group 4)

Hartleton channery silt loam, 20 to 35 percent slopes, moderately eroded (HhD2).—This soil occurs on steeper slopes than the soil described as typical of the Hartleton series. It is suited to permanent hay, which should be reseeded in contour strips. If large amounts of lime and fertilizer are added, a good cover of grass can be maintained to protect this soil from erosion. Trees suitable for planting are Norway spruce, European larch, and white pine. (Capability unit IVe–5; woodland group 13; building site group 4)

Hartleton channery silt loam, 20 to 35 percent slopes, severely eroded (HhD3).—This soil is steeper and more severely eroded than the soil described as typical of the Hartleton series. Little or none of the original surface soil remains.

This soil is suitable as woodland but can be used for pasture where a good sod is maintained. Contour furrows help to slow runoff and to increase the growth of forage. White pine, Norway spruce, Scotch pine, European larch, and black locust are suitable for planting. Food and cover for wildlife can be provided by planting autumn-olive, multiflora rose, bayberry, Tatarian honeysuckle, and silky cornel. (Capability unit VIe–3; woodland group 13; building site group 4)

Hartleton very stony silt loam, 0 to 12 percent slopes (HrB).—This soil has large blocks of sandstone on the surface and throughout the profile. Beneath a thin mat of leaves, a black, highly organic layer, about 2 inches thick, overlies a light grayish-brown mineral layer.

This soil should remain in trees and the trees be protected from fire and grazing. Selective cutting is needed to maintain yields. Cutting at the border of the woodland reduces competition with cultivated crops and also improves the habitat for wildlife. In some places clearing small areas for pasture may be practical. (Capability unit VIs–2; woodland group 12; building site group 3)

Hartleton very stony silt loam, 12 to 35 percent slopes (HrD).—This strongly sloping to steep soil has many more stones and large tree roots on and in it than has the soil described as typical of the series. Large blocks of sandstones are on the surface and throughout the profile. A thin layer of leaves covers about 2 inches of very dark gray humus that is underlain by 8 to 10 inches of light brownish-gray silt loam.

All of this soil is in trees, which should be protected from fire and grazing. The trees should be selectively cut in a way that maintains yields. Fair pasture can be produced, but clearing generally is not practical. (Capability unit VIs–2; woodland group 12; building site group 4)

Holly Series

The Holly series consists of deep, poorly drained and somewhat poorly drained soils that formed in recent deposits on nearly level flood plains. These soils most commonly lie along the smaller streams of the county.

A typical Holly soil has a dark reddish-gray silt loam plow layer that is 10 inches thick and contains a very few coarse fragments. This layer is wet for much of the year, and it is somewhat sticky and is difficult to till. The subsoil is mottled dark-red silty clay loam to a depth of 22 inches and is dark-gray silty clay between 22 inches and 30 inches. It contains a few coarse fragments, is sticky, and is strongly acid. The substratum is mottled dark-gray gravelly sandy loam in which gravel makes up as much as 80 percent of the soil mass. Depth to the underlying strata is several feet.

The subsoil and substratum vary considerably in texture and color, depending on the degree of stratification and the kind of material washed in. In most places depth to the water table is less than 2 feet. Depth to the sandy or gravelly material generally is less than 40 inches.

Holly soils formed from the same kind of material as the deep, moderately well drained Basher and Middlebury soils and commonly are in the same fields with them.

Holly soils are strongly acid in unlimed areas. They have moderate permeability and a high water table. Under good management, these soils produce satisfactory yields of shallow-rooted, moisture-tolerant crops.

Holly silt loam (0 to 3 percent slopes) (Hs).—This is the soil described as typical of the Holly series. Included in the mapping are some areas of silty clay loam and small areas of sandy loam.

This soil is suited to permanent hay and to alfalfa. If row crops are grown, a cropping system that lasts 3 years and includes at least 1 year of hay should be used. Bedding is effective in large fields. Random closed drains can be used to lower the water table in small wet spots. (Capability unit IIIw-2; woodland group 3; building site group 11)

Klinesville Series

The Klinesville series consists of shallow, well-drained soils that formed from glaciated red shale on gently sloping to steep uplands. These soils occur throughout most of the county.

A soil typical of the Klinesville series has a red shaly silt loam plow layer that is 10 inches thick and contains many chips of shale and a few fragments of sandstone. This layer is very loose and is easily tilled. Very little, if any, material occurs between the surface layer and the substratum. The substratum is coarsely fractured shale that is easily penetrated by the roots of most trees and some crops.

The surface layer is most commonly shaly silt loam, but in some areas it is very stony silt loam. In some places the surface layer overlies a platy substratum of red shale.

Klinesville soils formed from the same kind of shale as the moderately deep, well-drained Leck Kill soils and commonly occur in the same fields with them.

These soils have moderately rapid permeability and low moisture-holding capacity. Unlimed areas are acid. These soils are suited to crops that are deep rooted and drought resistant.

Klinesville shaly silt loam, 3 to 12 percent slopes, moderately eroded (KaB2).—This is the soil described as typical of the Klinesville series. Included in the mapping are some areas that are less shaly than normal.

If crops are grown in contour strips, a cropping system that includes 2 years of hay every 4 years is suitable. Diversion terraces are needed to protect the soil from erosion. (Capability unit IIIe-4; woodland group 16; building site group 5)

Klinesville shaly silt loam, 12 to 20 percent slopes, moderately eroded (KaC2).—This soil is steeper than the soil described for the Klinesville series, but it is like that soil in other respects.

This soil is not well suited to frequent use for row crops, but it generally is suited to permanent hay. If reseeding is necessary, it should be done on the contour. Alfalfa and birdsfoot trefoil generally grow well if large amounts of lime and fertilizer are added. In dry years crop failures are likely. (Capability unit IVe-3; woodland group 16; building site group 6)

Klinesville shaly silt loam, 12 to 20 percent slopes, severely eroded (KaC3).—This strongly sloping soil has lost most of its original surface soil through erosion. Although it has very low moisture-holding capacity, this soil can be used for pasture. Forage yields are low during dry periods. In some places diversion terraces help in getting more moisture into the soil. (Capability unit VIe-1; woodland group 21; building site group 6)

Klinesville shaly silt loam, 20 to 35 percent slopes, moderately eroded (KaD2).—This soil is steeper and shallower than the soil described as typical of the Klinesville series. It is suitable as woodland, but it can be used for pasture if birdsfoot trefoil and other drought-resistant plants are seeded. The woodland should be protected from fire and grazing. Trees suitable for planting are white pine, Scotch pine, European larch, Norway spruce, and red pine. (Capability unit VIe-2; woodland group 17; building site group 6)

Klinesville shaly silt loam, 20 to 35 percent slopes, severely eroded (KaD3).—Erosion has removed nearly all of the original surface layer from this soil and, in most places, has cut rills and small gullies. As a result, the soil is very shallow and droughty.

This soil is suitable as woodland and for wildlife habitat. Trees suitable for planting are white pine, Scotch pine, European larch, Norway spruce, and red pine. Silky cornel, shrub lespedeza, coralberry, and Tatarian honeysuckle provide food and cover for wildlife. (Capability unit VIIe-1; woodland group 22; building site group 6)

Klinesville and Leck Kill shaly silt loams, 35 to 70 percent slopes (KkE).—Klinesville soils make up about 65 percent of this mapping unit, and Leck Kill soils account for the rest. These soils are steeper than the soils described for the Klinesville and Leck Kill series, but each has a profile similar to the one described for its respective series.

These soils are suitable as woodland and for wildlife habitat. Trees suitable for planting are white pine, Scotch pine, European larch, Norway spruce, red pine, and black locust. Food and cover for wildlife can be provided by planting multiflora rose, silky cornel, shrub lespedeza, coralberry, Tatarian honeysuckle, autumn-olive, bayberry, and purple-osier willow. (Both soils in capability unit VIIe-1, woodland group 17, and building site group 7)

Klinesville and Leck Kill very stony silt loams, 0 to 12 percent slopes (KlB).—The Klinesville soil and Leck Kill soil in this mapping unit are stonier than the soils described as typical of the respective series. Large blocks of sandstone and a layer of leaf litter are on the surface. The depth to bedrock and the texture of the subsoil vary considerably within short distances.

Most of the acreage of these soils is wooded and should remain so. The trees should be protected from fire and grazing. These soils can be used for pasture, but clearing away the stones and trees is practical in only a few places. (Both soils in capability unit VIs-2, woodland group 16, and building site group 5)

Klinesville and Leck Kill very stony silt loams, 12 to 35 percent slopes (KlD).—The soils in this mapping unit are steeper and stonier than the soils described as typical of the respective series. A thin layer of humus and decaying leaves covers a red surface layer that contains large pieces of sandstone. In these soils the texture of the subsoil and the depth to bedrock vary widely within short distances.

These soils should remain in trees, and the trees be protected from fire and grazing. Pasture could be produced, but clearing away the stones and trees is practical

in only a few places. (Both soils in capability unit VIs-2, woodland group 16, and building site group 6)

Klinesville and Leck Kill very stony silt loams, 35 to 100 percent slopes (KlF).—Large stones are on the surface of these very steep, very stony soils. All of the acreage is wooded and should remain so. Woodland requires protection from fire and grazing and the interplanting of open areas with suitable trees. (Both soils in capability unit VIIs-1, woodland group 17, and building site group 7)

Lackawanna Series

The Lackawanna series consists of deep, well-drained soils formed in Wisconsin glacial till that was derived from acid red sandstone and shale. These soils are on gently sloping to steep uplands in the northern tip of the county.

A typical cultivated Lackawanna soil has a reddish-brown channery loam surface layer about 10 to 12 inches thick. This layer is easily crumbled and easily tilled. The subsoil is reddish-brown to weak-red loam and contains more and larger fragments of rock than the surface soil. It is slightly sticky, but it does not seriously obstruct the movement of water and the growth of roots. The substratum, beginning at a depth of about 4 feet, consists of gravelly and channery loam and of rock fragments that make up most of the soil mass.

The subsoil is mostly loam, but it is silt loam in some places. Depth to the substratum is 40 to 50 inches, and depth to bedrock is several feet.

The Lackawanna soils formed from the same kind of glacial material as the shallow to moderately deep, well drained Oquaga soils and the moderately well drained Wellsboro soils and commonly are in the same fields with those soils. On steep mountains, the Lackawanna soils are in areas below areas of shallow to moderately deep, well-drained Lordstown soils.

Lackawanna soils are strongly acid in unlimed areas, but crops on them respond well to additions of lime and fertilizer. These soils have moderate permeability and high moisture-holding capacity. They are suited to all of the crops commonly grown in the county.

Lackawanna channery loam, 3 to 12 percent slopes, moderately eroded (LaB2).—This is the soil described as typical of the Lackawanna series. Included in the mapping are some areas of silt loam and some areas that contain lenses of a mottled soil below a depth of 30 inches.

Crops can be grown in contour strips in a cropping system that provides 1 year of hay in every 4 years. Satisfactory yields can be expected if adequate amounts of lime and fertilizer are added. (Capability unit IIe-1; woodland group 5; building site group 1)

Lackawanna channery loam, 12 to 20 percent slopes, moderately eroded (LaC2).—This soil is steeper and thinner than the soil described for the Lackawanna series. It has lost about half of its original surface soil through erosion.

If crops are grown on this soil, they should be seeded in contour strips, and a cropping system that provides at least 2 years of hay in every 5 years should be followed. Diversion terraces are needed to intercept runoff and to protect the soil from erosion. Large amounts of lime and fertilizer are needed to maintain satisfactory yields. (Capability unit IIIe-1; woodland group 5; building site group 2)

Lackawanna channery loam, 20 to 35 percent slopes, moderately eroded (LaD2).—This steep, moderately eroded soil has lost much of its original surface layer. Most of the acreage is wooded, but this soil can be used for permanent hay. Reseeding should be done in contour strips. Large amounts of lime and fertilizer are needed to maintain adequate yields of forage. (Capability unit IVe-4; woodland group 6; building site group 2)

Lackawanna very stony loam, 0 to 12 percent slopes (LcB).—This soil is stonier than the soil described for the Lackawanna series. Large pieces of sandstone are on the surface and throughout the profile. Also, on the surface is a cover of dark-gray humus and partly decayed leaves.

This soil is suitable for trees and wildlife habitat. The woodland needs to be protected from fire and grazing. By selective cutting, productive stands can be maintained. This soil is suitable for pasture if stones and trees are cleared, but clearing is not practical in most places. (Capability unit VIs-1; woodland group 5; building site group 3)

Lackawanna very stony loam, 12 to 35 percent slopes (LcD).—This steep soil has large stones on its surface and throughout the profile, and its surface is covered by leaves and humus. Included in mapped areas are some moderately well drained areas.

This soil can be used as woodland, for wildlife habitat, and for recreational areas. The woodland should be protected from fire and from grazing. Red pine is suitable for interplanting in open areas. Selective cutting of the trees is needed to maintain productive stands. This soil could be used as pasture, but clearing away the stones and trees is generally impractical. (Capability unit VIs-1; woodland group 5; building site group 4)

Lackawanna and Oquaga very stony soils, 35 to 100 percent slopes (LdF).—This mapping unit is made up of about equal parts of very stony Lackawanna soil and very stony Oquaga soil. The Lackawanna soil is steeper than the soil described as typical of the Lackawanna series, but the profile of the two soils is somewhat similar. The Oquaga soil is shallow and very steep. Within short distances, the soils in this mapping unit range from deep to shallow. Rock crops out on the surface. A thin mat of leaves covers the surface of these soils, and many large stones are on the surface and throughout the profile.

Most areas of these soils are suited as woodland, but some areas are too steep and rocky for any use other than wildlife habitat. Trees should be selectively cut and protected from fire. (Both soils in capability unit VIIs-1, woodland group 6, and building site group 7)

Laidig Series

The Laidig series consists of deep, well-drained soils that formed in colluvium, mostly acid sandstone. These soils are in gently sloping and moderately sloping areas along the base of most mountains in the county.

A typical Laidig soil has a surface layer of strong-brown very stony loam that is covered by about 3 inches of gray, silty humus and leaves. The surface layer is about 9 inches thick and contains many semirounded

pieces of sandstone of stone size. Although the surface layer is loose, stones prevent tillage. The subsoil is strong-brown sandy clay loam that is firm when moist and slightly sticky when wet. It contains about the same amount of stones as the surface layer. A dense, compact layer occurs at a depth of more than 30 to 36 inches. In the substratum stones make up more than 90 percent of the soil mass and have unconsolidated sand between them. At about 6 feet the substratum grades to hard bedrock.

The surface layer is very stony loam or gravelly loam, and the subsoil varies widely in texture. Depth to the substratum averages more than 3 feet, and depth to bedrock ranges from 4 to 20 feet.

The Laidig soils formed from the same kind of colluvium as the moderately well drained Buchanan soils and commonly are on slopes immediately above them.

Laidig soils are strongly acid in unlimed areas. They have moderate permeability and high moisture-holding capacity. Except for the very stony areas, these soils are suitable for most of the crops commonly grown in the county.

Laidig gravelly loam, 3 to 12 percent slopes, moderately eroded (LeB2).—This soil does not have large stones on the surface and throughout the profile. All of the acreage has been cleared and is used for crops. Crops can be grown in contour strips in a cropping system that includes hay every fourth year, but heavy applications of lime and fertilizer are needed for satisfactory yields. In some places diversion terraces are needed to intercept runoff from higher areas. (Capability unit IIe-2; woodland group 5; building site group 1)

Laidig gravelly loam, 12 to 20 percent slopes, moderately eroded (LeC2).—This strongly sloping soil does not have large stones on the surface and throughout the profile. All of the acreage has been cleared and cropped at some time, but most of it is now in pasture or permanent hay. Crops can be grown in contour strips in a cropping system that lasts 5 years and provides at least 2 years of hay, but a permanent cover of grass is needed in the natural drainageways. In some places diversion terraces are needed to intercept runoff from higher areas. (Capability unit IIIe-5; woodland group 5; building site group 2)

Laidig very stony loam, 0 to 12 percent slopes (LfB).—This soil is not so steep nor so shallow as the soil described as typical of the Laidig series, and in some places it has a fine-textured substratum.

This soil should be kept in trees that are protected from fire and grazing. It could provide some pasture if it were cleared, but in most places clearing away the stones and trees is impractical. Selective cutting of the trees helps to maintain productive stands. European larch, black locust, Norway spruce, and white pine are suitable for interplanting in open areas. (Capability unit VIs-1; woodland group 5; building site group 3)

Laidig very stony loam, 12 to 35 percent slopes (LfD).—This is the soil described as typical of the Laidig series. It is suitable for trees, which should be protected from fire. The trees should be selectively cut if yields are to be maintained. Plants that provide food and cover for wildlife are silky cornel, autumn-olive, bayberry, multiflora rose, Tatarian honeysuckle, and shrub lespedeza. If cleared, this soil would be suited to pasture, but this operation is practical in only a few places. (Capability unit VIs-1; woodland group 5; building site group 4)

Lawrenceville Series

The Lawrenceville series consists of deep, moderately well drained soils that formed from fine windblown material on nearly level to moderately sloping uplands. These soils are in a band that extends in an east-west direction immediately north of the outwash terraces along the Susquehanna River, especially those near Bloomsburg.

A typical cultivated Lawrenceville soil has a plow layer of dark grayish-brown silt loam that is 8 inches thick and overlies about 6 inches of yellowish-brown silt loam. The plow layer is loose and easily worked, but it is erodible. The subsoil is yellowish-brown to dark-brown silt loam that is mottled at a depth of about 24 inches. At a depth of about 32 inches, a dense compact layer occurs that restricts the movement of water and the growth of roots. The substratum is mottled, yellowish-brown fine sandy loam that is very compact and strongly acid. It is underlain by gravel at a depth of about 64 inches.

The subsoil ranges from light silty clay loam to fine sandy loam. Depth to mottling ranges from about 18 to 30 inches, and depth to the substratum ranges from 36 to 72 inches. In a few places gravel occurs at a depth of less than 3 feet.

Lawrenceville soils formed from the same kind of fine windblown material as the deep, well-drained Duncannon soils and commonly occur in the same fields with them.

Unless they are limed, Lawrenceville soils are strongly acid. They have moderate permeability and high moisture-holding capacity. Crops respond well to additions of lime and fertilizer. These soils are well suited to most of the crops commonly grown in the county except alfalfa.

Lawrenceville soils are not mapped separately in Columbia County. They are mapped in undifferentiated units with the Duncannon soils because they occur with those soils and have about the same general use and capability. The Lawrenceville soils, however, are not suited to so wide a range of crops as the Duncannon soils and are not so well suited for building sites.

Lawrenceville and Duncannon silt loams, 3 to 8 percent slopes (LgB).—This mapping unit consists mainly of moderately well drained Lawrenceville silt loam and well drained Duncannon silt loam. These soils are susceptible to erosion. Included in mapping are small eroded areas where runoff has concentrated and cut gullies. These eroded areas occur principally along the roadways of housing developments.

These soils should be farmed in graded strips in a cropping system that provides 2 years of hay in every 5 years. Diversion terraces may be needed to intercept runoff. Exceptionally good cover is needed in all outlets before any water is turned into them. (Both soils in capability unit IIe-3, woodland group 7, and building site group 8)

Lawrenceville and Duncannon silt loams, 8 to 12 percent slopes, moderately eroded (LgC2).—This mapping unit is steeper than Lawrenceville and Duncannon silt loams, 3 to 8 percent slopes, and it has lost about half of its original surface soil through erosion. Little or none of the material below the present plow layer is original surface soil.

On these soils crops should be grown in graded strips in a cropping system that provides at least 2 years of hay

in every 4 years. Natural drainageways should be kept in a permanent cover of grass. Diversion terraces are needed to intercept runoff and to protect these soils from erosion. (Both soils in capability unit IIIe-2, woodland group 7, and building site group 9)

Leck Kill Series

The Leck Kill series consists of deep and moderately deep, well-drained soils that formed from glaciated red shale and sandstone on nearly level to strongly sloping uplands. These soils occur in scattered areas throughout most of the drainage basins of Fishing, Catawissa, and Roaring Creeks.

A typical cultivated Leck Kill soil has a dark-brown channery silt loam plow layer that is about 8 inches thick and contains fragments of sandstone and chips of shale. This layer is easily crumbled, and except in a few places where it contains many fragments of sandstone, it is easily tilled. The subsoil is reddish-brown channery silt loam that extends to a depth of about 32 inches. Its content of rock fragments is slightly greater than that of the plow layer. The substratum is reddish-brown channery clay loam about 6 inches thick. It is fairly sticky and is strongly acid. Bedrock is red shale.

The surface layer is channery silt loam and very stony silt loam. In some places it is red or reddish brown. The subsoil is loam, silt loam, or silty clay loam and is channery in most places. In some places shale chips make up about 50 percent of the subsoil. Depth to bedrock ranges from less than 2 feet to 6 feet or more.

Leck Kill soils formed from the same kind of glaciated material as the shallow, well drained Klinesville soils and the moderately well drained or somewhat poorly drained Albrights soil and commonly are in the same fields with them.

These soils are strongly acid in unlimed areas. They have moderate permeability and moderate to high moisture-holding capacity. Crops respond well to additions of lime and fertilizer. These soils are suited to all of the crops commonly grown in the county.

Leck Kill channery silt loam, 0 to 3 percent slopes (LkA).—This nearly level soil is deeper than the soil described for the Leck Kill series, for it has received deposits from higher areas.

Row crops can be grown continuously on this soil if contour tillage is practiced to conserve moisture. Additions of lime and fertilizer are needed to maintain satisfactory yields. (Capability unit IIs-2; woodland group 12; building site group 3)

Leck Kill channery silt loam, 3 to 12 percent slopes, moderately eroded (LkB2).—This is the soil described as typical of the Leck Kill series. If large amounts of lime and fertilizer are applied, crops can be grown in contour strips in a cropping system that lasts 4 years and includes 1 year of hay. Diversion terraces are needed on long slopes to intercept runoff and to protect the soil from erosion. (Capability unit IIe-5; woodland group 12; building site group 3)

Leck Kill channery silt loam, 12 to 20 percent slopes, moderately eroded (LkC2).—Because this soil has steeper slopes than the soil described as typical of the Leck Kill series, it loses more water through rapid runoff and has less moisture available for crops. Crops should be grown in contour strips in a cropping system that lasts 5 years and includes at least 3 years of hay. Diversion terraces are needed to intercept runoff, to protect the soil from erosion, and to increase the amount of moisture that enters the soil. Additions of lime and fertilizer are needed to maintain production. (Capability unit IIIe-3; woodland group 12; building site group 4)

Leck Kill channery silt loam, 12 to 20 percent slopes, severely eroded (LkC3).—This soil has lost most of its original surface soil through erosion. It has low moisture-holding capacity, but it is suited to permanent hay. Reseeding, if needed, should be done in contour strips. Large amounts of lime and fertilizer are needed to maintain satisfactory yields of high-quality forage. Trees suitable for planting are red pine, white pine, and European larch. (Capability unit IVe-1; woodland group 12; building site group 4)

Leck Kill channery silt loam, 20 to 35 percent slopes, moderately eroded (LkD2).—This soil is steeper and shallower than the soil described as typical of the Leck Kill series. It is suited to permanent hay if diversion terraces are installed to intercept runoff and to increase the amount of water entering the soil. Heavy applications of lime and fertilizer are needed for maintaining lush growth. Contour furrows help to reduce runoff and to increase yields of forage. (Capability unit IVe-5; woodland group 13; building site group 4)

Leck Kill channery silt loam, 20 to 35 percent slopes, severely eroded (LkD3).—Erosion has removed most of the original surface layer from this soil and, in many places, has cut a pattern of rills and small gullies.

This soil can be used for pasture if runoff is intercepted by diversion terraces and large amounts of lime and fertilizer are added. If trees are more desirable than pasture, white pine, red pine, Scotch pine, or European larch can be planted. (Capability unit VIe-3; woodland group 13; building site group 4)

Leck Kill channery silt loam, deep, 0 to 3 percent slopes (LlA).—This soil is deeper than the soil described as typical of the Leck Kill series, for it has received deposits from higher areas. Row crops can be grown continuously if a cover crop is seeded after the row crop is harvested and if contour farming is practiced. This soil produces favorable yields where adequate amounts of lime and fertilizer are added. (Capability unit I-1; woodland group 12; building site group 1)

Leck Kill channery silt loam, deep, 3 to 12 percent slopes, moderately eroded (LlB2).—Included in areas mapped as this soil are small, severely eroded areas in which special treatment is needed. Crops can be grown in a cropping sequence of row crops for 2 years, a small grain, and hay if they are planted in contour strips and diversion terraces are installed to intercept runoff and protect the soil from erosion. The severely eroded areas can be maintained in a permanent cover of grass and used as outlets for the diversion terraces. (Capability unit IIe-1; woodland group 12; building site group 1)

Leck Kill channery silt loam, deep, 12 to 20 percent slopes, moderately eroded (LlC2).—This moderately steep soil is slightly shallower than deep Leck Kill soils that have slopes of less than 12 percent. Stripcropping and diversion terraces are needed to protect the soil from erosion. Also advisable is growing hay for at least 2 years in every 4 years. If a row crop is grown, it should

be followed by a cover crop. Further protection is provided by keeping the natural drainageways in a permanent cover of grass. (Capability unit IIIe–1; woodland group 12; building site group 2)

Leck Kill channery silt loam, deep, 12 to 20 percent slopes, severely eroded (LlC3).—This soil is steeper and more severely eroded than the soil described as typical of the series. Most of its original surface soil has been lost, and subsoil material has been mixed into the plow layer. Included in the mapping are small areas that have slopes of more than 20 percent.

This soil is suited to permanent hay. If reseeding is necessary, it should be done in contour strips. Diversion terraces are needed to protect the soil from erosion. (Capability unit IVe–1; woodland group 12; building site group 2)

Leck Kill very stony silt loam, deep, 0 to 12 percent slopes (LmB).—This soil has a dark reddish-brown surface layer that is about 10 inches thick and is covered by gray, silty humus and leaf litter. Large blocks of sandstone are on the surface and in the soil.

All of this soil is woodland, which is a good use, but the trees need protection from fire and grazing. Good yields can be maintained if mature trees are selectively cut. Good pasture can be produced if this soil is cleared, but clearing is practical in only a few places. (Capability unit VIs–1; woodland group 12; building site group 3)

Leck Kill very stony silt loam, deep, 12 to 35 percent slopes (LmD).—This deep, very stony soil is wooded in all areas and has a reddish-brown surface layer that is covered by a thin mat of leaves and humus. Protection of the woodland from fire is needed. The trees should be selectively cut in a way that maintains yields. Trees suitable for planting in open areas are white pine, European larch, Norway spruce, red pine, and black locust. Good pasture could be produced, but clearing generally is not practical. (Capability unit VIs–1; woodland group 12; building site group 4)

Leck Kill very stony silt loam, deep, 35 to 60 percent slopes (LmE).—This soil occurs on much steeper slopes than the soil described as typical of the Leck Kill series. Large stones are on the surface and in the soil.

All of this soil is wooded. The trees should be protected from fire and selectively cut so that yields are maintained. Food and cover for wildlife can be provided by planting silky cornel, coralberry, bayberry, Tatarian honeysuckle, and multiflora rose. (Capability unit VIIs–2; woodland group 13; building site group 7)

Lickdale Series

The Lickdale series consists of deep, very poorly drained soils that formed from glaciated acid sandstone and shale in nearly level and gently sloping upland areas. These soils occur in small scattered basins and depressions throughout most of the county.

A soil typical of the Lickdale series has a 7-inch surface layer that consists of 2 inches of black mucky silt loam over about 5 inches of mottled very dark grayish-brown silt loam. This layer is sticky, and it is waterlogged for most of the year. The upper subsoil extends to a depth of about 30 inches and is mottled gray and yellowish-brown silty clay loam that is sticky and wet for most of the year. A few roots of moisture-tolerant plants penetrate this layer. The lower subsoil extends to 40 inches and is mottled brownish-yellow silt loam that is wet and very strongly acid. In most places the subsoil gradually becomes coarser textured as depth increases below 40 inches.

The surface layer is silt loam and very stony silt loam, and the subsoil ranges from silty clay to silt loam. Most areas recently received deposits from higher areas.

The Lickdale soils formed from a variety of glacial materials, but they are normally surrounded by the poorly drained Ravenna, Morris, and Shelmadine soils.

Lickdale soils are strongly acid. They are slowly permeable and hold large amounts of water, but most of it is not available to plants. These soils are suited to only a few kinds of trees and shrubs that provide food and cover for wildlife.

Lickdale silt loam (0 to 3 percent slopes) (Ln).—This is the soil described as typical of the Lickdale series. It is suitable for wildlife habitat, but areas that can be drained by a system of open drains are suitable for pasture. Hemlock, white pine, and white spruce are suitable for planting, but the windthrow hazard is severe. Areas of this soil can be improved as wildlife habitat by constructing ponds, developing marshes, and planting highbush cranberry, Tatarian honeysuckle, and purple-osier willow. (Capability unit IVw–2; woodland group 23; building site group 10)

Lickdale very stony silt loam (0 to 8 percent slopes) (Lo).—This soil has large pieces of sandstone and conglomerate on the surface and throughout the profile. It is suitable as woodland and for wildlife habitat. Trees suitable for planting are white pine, hemlock, and white spruce. Highbush cranberry, Tatarian honeysuckle, and bayberry provide food and cover for wildlife. Marshes can be developed in some places, but ponds generally are difficult to construct. (Capability unit VIIs–3; woodland group 23; building site group 10)

Litz Series

The Litz series consists of shallow and moderately deep, well-drained soils that formed from glaciated, limy, dark-gray shale. These soils are in gently sloping to steep upland areas, most commonly in the west-central part of the county.

A typical Litz soil has a yellowish-brown silt loam plow layer about 6 inches thick. This layer crumbles easily, but in many eroded areas it is so shaly that tillage is difficult. The subsoil is yellowish-brown shaly silt loam that is about half soft shale. This layer permits the penetration of roots and the movement of air and water, for it is quite porous. In most places the subsoil extends to a depth of about 15 inches and is underlain by a substratum of soft, very dark gray shale. A small amount of brown silt loam is in the cracks of the shale. The hardness of the shale increases with depth, and in deep cuts the shale reacts with acid.

Depth to shale ranges from 10 to 30 inches. In some places where shale is near the surface, it reacts with acid, but most commonly there is no reaction above a depth of 6 feet. In the area near Briar Creek these soils contain some limestone.

The Litz soils formed from the same kind of calcareous shale as the deep, well-drained Westmoreland soils and commonly are in the same fields with them.

The Litz soils are strongly acid at the surface in unlimed areas. The substratum is almost neutral. Permeability is rapid, and moisture-holding capacity is moderate. Crops commonly grown in the county are suited to these soils.

Litz silt loam, 3 to 12 percent slopes, moderately eroded (LpB2).—This moderately eroded soil is more gently sloping and slightly deeper than the soil described as typical of the Litz series. Crops should be grown in contour strips in a cropping system that lasts 5 years and includes at least 3 years of hay. Diversion terraces are needed on long slopes to intercept runoff, to protect the soil from erosion, and to increase the amount of moisture that enters the soil. Good management is needed to maintain the organic-matter content and to keep the soil in good tilth. (Capability unit IIIe-3; woodland group 12; building site group 5)

Litz silt loam, 12 to 20 percent slopes, moderately eroded (LpC2).—This is the soil described as typical of the Litz series. It is suitable for permanent hay. All reseeding should be done in contour strips. In some places diversion terraces are needed to intercept runoff and to permit more moisture to enter the soil. Large amounts of fertilizer and some lime are needed for satisfactory yields. (Capability unit IVe-1; woodland group 12; building site group 6)

Litz and Weikert shaly silt loams, 12 to 20 percent slopes, severely eroded (LrC3).—Erosion has removed most of the original surface layer from the soils in this mapping unit. Because this removal included most of the fine material, the present plow layer is very shaly and holds little moisture.

The soils in this mapping unit can be used for pasture if a cover of birdsfoot trefoil or other drought-resistant plants can be maintained. If diversion terraces can be constructed, they help to intercept runoff and to collect water where it is needed. These terraces are difficult to construct, however, because the depth to bedrock is limited. (Capability unit VIe-1; woodland group 16; building site group 6)

Litz and Weikert shaly silt loams, 20 to 35 percent slopes, severely eroded (LrD3).—The soils in this mapping unit are steep, shallow, and droughty. Because they have lost most of their original surface soil through erosion, hardly any material except shale remains. Much of this shaly material is acid.

These soils have little use except as woodland and for wildlife habitat. Trees suitable for planting are Norway spruce, red pine, white pine, European larch, and black locust. Food and cover for wildlife can be provided by planting Tatarian honeysuckle, autumn-olive, silky cornel, bayberry, and multiflora rose. (Capability unit VIIe-1; woodland group 17; building site group 6)

Litz and Weikert shaly silt loams, 35 to 50 percent slopes, moderately eroded (LrE2).—Most areas of these very steep soils are moderately eroded and are used for woodland pasture, but some areas have not been pastured and are not eroded. Hard, very dark gray, limy shale and dark-colored acid shale crop out on the surface in a few places.

The soils in this mapping unit should be kept in trees that are protected from fire and grazing. Black locust, Norway spruce, red pine, and white pine are suitable trees for planting in open areas. Autumn-olive, bayberry, multiflora rose, and Tatarian honeysuckle provide food and cover for wildlife. (Capability unit VIIe-1; woodland group 17; building site group 7)

Lordstown Series

The Lordstown series consists of shallow and moderately deep, well-drained soils formed in Wisconsin glacial till that was derived from acid gray sandstone and shale. These soils are in nearly level to steep upland areas in the northeastern part of the county.

A typical cultivated Lordstown soil has a dark-brown channery silt loam plow layer about 9 inches thick. This layer is easily crumbled and is moderately easy to till. The subsoil extends to a depth of about 2 feet and consists of yellowish-brown channery silt loam that contains a little more clay than the plow layer. It is porous and is easily penetrated by roots, water, and air. The substratum consists of fragmented shale and sandstone that has thin films of clay on the upper part of the fragments. This layer is only a few inches thick, and it is underlain by shale bedrock that, except for scattered cracks, is solid.

The surface layer is channery silt loam and very stony silt loam. Depth to bedrock ranges from 1 to 3 feet.

The Lordstown soils formed from the same kind of glacial material as the deep, well drained Wooster soils and the moderately well drained Canfield soils and commonly are in the same fields with them.

Lordstown soils are strongly acid in unlimed areas. They have moderately rapid permeability and moderate to low moisture-holding capacity. They are suited to most of the crops commonly grown in the county. Crops respond fairly well to additions of lime and fertilizer.

Lordstown channery silt loam, 3 to 12 percent slopes, moderately eroded (LsB2).—This is the soil described as typical of the Lordstown series. Included in the mapping are small severely eroded areas and narrow bands of a deeper soil. The deeper soil is on the uphill side of stone fences and hedgerows.

Crops produce satisfactory yields if cultivation is in contour strips and the cropping system lasts 3 years and includes 1 year of hay. The stone fences and hedgerows ought to be removed if they interfere with contour farming. By installing diversion terraces, runoff can be intercepted. (Capability unit IIe-4; woodland group 12; building site group 3)

Lordstown channery silt loam, 12 to 20 percent slopes, moderately eroded (LsC2).—This moderately eroded soil is steeper and shallower than the soil described for the series. Included in the mapping are small severely eroded areas. Above the hedgerows and stone fences additional soil material has accumulated.

Crop yields are satisfactory if contour strips are used and the cropping system lasts 3 years and includes at least 1 year of hay. Diversion terraces are needed to intercept runoff, to permit more moisture to enter the soil, and to protect the soil from erosion. Natural drainageways should be kept in a permanent cover of grass. (Capability unit IIIe-4; woodland group #12; building site group 4)

Lordstown channery silt loam, 20 to 35 percent slopes, moderately eroded (LsD2).—This moderately eroded, steep soil is shallower than the soil described for the series,

and generally it has more fragments on or near the surface. It is suited to permanent hay, which should be reseeded in contour strips. Constructing diversion terraces on this soil is difficult, but in many places water can be diverted before it reaches this soil. Large amounts of lime and fertilizer are needed to maintain a good cover of grass. (Capability unit IVe–5; woodland group 13; building site group 4)

Lordstown very stony silt loam, 0 to 12 percent slopes (LtB).—This soil has large blocks of sandstone on the surface and throughout the profile. All of its acreage is wooded. A thin layer of leaves and humus is on the surface and is underlain by 2 inches of light ashy silt loam that, in turn, is underlain by a layer of brown silt loam. This soil is suitable as woodland, but protection from fire and grazing is needed. If this soil is cleared, it can be used for pasture. (Capability unit VIs–2; woodland group 12; building site group 3)

Lordstown very stony silt loam, 12 to 35 percent slopes (LtD).—A cover of organic matter and large blocks of sandstone are on the surface of this soil. The blocks of sandstone also occur in the soil. This soil is suitable for little other than trees and wildlife habitat. The trees should be protected from fire and, for sustained yields, should be selectively cut. Although fair pasture could be produced if this soil were cleared, clearing is practical in only a few areas. (Capability unit VIs–2; woodland group 12; building site group 4)

Lordstown very stony silt loam, 35 to 100 percent slopes (LtF).—This very steep soil has many large blocks of sandstone on the surface and in the soil, and bedrock crops out in many places. Wildlife habitat and woodland are suitable uses, but harvesting the trees is difficult. Even in areas where the trees cannot be harvested economically, the woodland should be protected from fire, for the trees provide food and cover for wildlife. Also, they protect the watershed and add beauty to the area. (Capability unit VIIs–1; woodland group 13; building site group 7)

Made Land

Made land (Ma) consists mostly of fill material that has no true profile because it is so variable. Most areas of this land type are now covered with pavement or are used for sites for buildings, and the rest are used for lawns. These areas are principally in the larger towns of the county. (Capability unit VIIIs–1; woodland group and building site group not assigned)

Middlebury Series

The Middlebury series consists of deep, moderately well drained or somewhat poorly drained soils that formed in recent alluvium deposited on nearly level and gently sloping flood plains. These soils occur along the major streams of the county.

A typical cultivated Middlebury soil has a 9-inch dark grayish-brown silt loam plow layer that, in some places, contains a little fine gravel. This layer is easily crumbled and easily tilled. The layers underlying the surface layer are very similar to the surface layer, except for strata of different materials and for impeded drainage that is indicated by grayish mottles at a depth of about 18 inches. The substratum is stratified sand and gravel.

The texture and color of these soils vary widely according to the stratification and the variation of the sediments in which they formed. Depth to mottling ranges from 15 to 30 inches.

The Middlebury soils formed from the same kind of alluvium as the deep, well-drained Tioga soils and commonly are in the same fields with them.

Middlebury soils are acid in unlimed areas. They are moderate in permeability and in moisture-holding capacity. Crops respond well to additions of lime and fertilizer. These soils are suited to most of the shallow-rooted crops commonly grown in the county. Some areas are flooded occasionally.

Middlebury fine sandy loam (0 to 3 percent slopes) (Mb).—This soil has a coarser textured surface layer than the soil described as typical of the Middlebury series, and it is more rapidly permeable in the upper layers. Row crops can be grown continuously on this soil if the crop rows are slightly graded to improve drainage. A cover crop should be seeded after the row crop is harvested. If adequate amounts of lime and fertilizer are added, satisfactory crop yields can be expected. This soil is occasionally flooded for short periods in spring before crops are planted. (Capability unit IIw–1; woodland group 2; building site group 11)

Middlebury silt loam (0 to 3 percent slopes) (Md).—This is the soil described as typical of the Middlebury series. It is susceptible to flooding in spring but generally dries in time for crops to be seeded. Row crops can be grown continuously if the crop rows are slightly graded. Cover crops are needed to maintain good tilth and to protect the soil from scouring. Random closed drains may be needed to drain wet spots. Satisfactory yields can be expected if adequate amounts of lime and fertilizer are added. (Capability unit IIw–1; woodland group 2; building site group 11)

Mine Dumps

Mine dumps (Mn) consist of slate, shale, and coal. They are extremely acid and produce no vegetation. They are located in the southern tip of the county. (Capability unit VIIIs–1; woodland group and building site group not assigned)

Morris Series

The Morris series consists of deep, poorly drained and somewhat poorly drained soils that formed from Wisconsin glacial till in nearly level to gently sloping upland areas. These soils occur in the northeastern part of the county.

A typical Morris soil has a dark-gray channery silt loam surface layer about 5 inches thick. This layer commonly shows the effects of trampling by cattle. It is normally wet and difficult to till. The subsoil, to a depth of about 13 inches, is mottled gray silty clay loam that contains a few more shale chips and sandstone fragments than the surface layer. At a depth of 13 to 38 inches is a mottled light-gray to strong-brown clay loam layer that is almost impervious to roots and water. The

substratum consists of reddish-gray sandstone, or graywacke, that contains many impurities of fine material.

The surface layer is channery silt loam and very stony silt loam. Depth to the nearly impervious layer ranges from about 12 to 18 inches, and depth to bedrock ranges from about 3 to 5 feet. In these soils the matrix and mottles vary widely in color, but gray, red, and brown are predominant.

The Morris soils formed from the same kind of glacial material as the moderately well drained Wellsboro soils and commonly are in the same fields with them.

Morris soils are strongly acid in unlimed areas. They have slow permeability and moderate moisture-holding capacity. These soils are commonly used for pasture, but under good management, they are suited to shallow-rooted summer crops.

Morris channery silt loam, 3 to 8 percent slopes (MrB).—This is the soil described as typical of the Morris series. It is used mostly for pasture, but a few areas are cultivated. Crops can be grown in graded strips. If the organic matter is maintained, a suitable cropping sequence is a row crop, a small grain, and hay. Compaction can be prevented by keeping equipment off this soil in wet periods. This soil is suitable for constructing ponds, and most areas can be developed for other recreational uses. (Capability unit IIIw–1; woodland group 14; building site group 10)

Morris very stony silt loam, 0 to 8 percent slopes (MsB).—This soil has large pieces of sandstone in it and on its surface. The surface is covered by a mat of very dark gray humus about 2 inches thick.

This soil is mostly wooded. Norway spruce, white spruce, and hemlock are suitable for planting in open areas. If odd areas are planted to Tatarian honeysuckle, silky cornel, and multiflora rose, food and cover for wildlife are provided. Constructing ponds and developing marshy areas should be considered. (Capability unit VIIs–3; woodland group 14; building site group 10)

Mucky Peat

Mucky peat (Mu) is in bogs and consists of organic deposits that were derived from sedges, mosses, leaves, roots, and other woody vegetation laid down in permanent bodies of water. It is principally in the area of the Espy bog. No other organic soils are mapped in the county.

A typical area of Mucky peat has an 8-inch surface layer of thick, black silty peat that is very fertile but is too wet to be tilled. The subsurface layer is dark-gray silty muck that normally is saturated with water. The underlying mineral soil is mottled light brownish-gray sandy clay loam.

Mucky peat ranges from 18 inches to several feet in thickness. The underlying mineral soil ranges from gravelly sandy clay loam to silty clay. Mucky peat normally occurs with the Atherton and Braceville soils.

This organic soil is very acid and has slow permeability. Its moisture-holding capacity is high. Sufficiently drained areas are well suited for intensive truck farming. Because the water table is high, Mucky peat is generally suitable for little other than wildlife. (Capability unit VIIIw–1; building site group 11; woodland group not assigned)

Oquaga Series

The Oquaga series consists of shallow to moderately deep, well-drained soils formed from Wisconsin glacial till that was derived from acid red shale and sandstone. These soils occupy gently sloping to strongly sloping upland areas in the northeastern part of the county.

A typical cultivated Oquaga soil has a dark-brown channery silt loam plow layer about 8 inches thick. This layer is easily crumbled, and except where sandstone fragments and shale chips are too numerous, it is easily tilled. The subsoil, extending to a depth of about 16 inches, is yellowish-red channery silt loam that contains many coarse fragments and stones. This layer is porous and it is permeable to roots, water, and air. The substratum is reddish-brown channery silt loam to a depth of about 2 feet, where it is underlain by hard red shale.

In many places the texture of the subsoil is almost the same as that of the plow layer. Depth to the substratum ranges from 10 to 20 inches, and depth to bedrock ranges from 20 to 30 inches.

The Oquaga soils formed from the same kind of glacial material as the deep, well drained Lackawanna soils and commonly are adjacent to them.

Oquaga soils are strongly acid in unlimed areas. They have moderately rapid permeability and low to moderate moisture holding capacity. Crops respond fairly well to additions of lime and fertilizer. These soils are fairly well suited to most of the crops commonly grown in the county.

Oquaga channery silt loam, 3 to 12 percent slopes, moderately eroded (OcB2).—This is the soil described as typical of the Oquaga series. Included in the mapping are some wooded areas that are only slightly eroded. Crops should be grown in contour strips in a cropping system that lasts 3 years and provides 1 year of hay. Diversion terraces can be used to intercept runoff, to help protect the soil from erosion, and to permit more moisture to enter the soil. Large additions of lime and fertilizer are needed for satisfactory yields. (Capability unit IIe–4; woodland group 12; building site group 5)

Oquaga channery silt loam, 12 to 20 percent slopes, moderately eroded (OcC2).—This soil is steeper and shallower than the soil described as typical of the Oquaga series. A cropping system is suitable that provides at least 2 years of hay in every 4 years. Natural drainageways can be protected by a permanent cover of grass. The crops should be seeded in contour strips, and diversion terraces should be installed to intercept runoff and to protect the soil from erosion. (Capability unit IIIe–4; woodland group 12; building site group 6)

Oquaga channery silt loam, 20 to 35 percent slopes, moderately eroded (OcD2).—This steep soil is shallower than the soil described for the Oquaga series, for erosion has removed more of its original surface soil. The moisture-holding capacity is very low.

This soil is suited to pasture if large amounts of lime and fertilizer are added. Contour furrows are needed so that runoff is retarded and more water enters the soil. Overgrazing should be avoided. (Capability unit IVe–5; woodland group 13; building site group 6)

Oquaga very stony silt loam, 0 to 12 percent slopes (OsB).—This soil is deeper than the other Oquaga soils

mapped in the county, but the large stones on and in it prevent use for little other than woodland and wildlife habitat. All of the acreage is wooded. The woodland should be protected from fire and grazing, and mature trees should be selectively cut. Cleared areas would be suited to pasture, but in most places clearing would be too expensive. (Capability unit VIs-2; woodland group 12; building site group 5)

Oquaga very stony silt loam, 12 to 35 percent slopes (OsD).—This soil has outcrops of sandstone on the surface and large blocks of sandstone on the surface and in the soil. All of the acreage is wooded. The woodland should be protected from fire and grazing. Food and cover for wildlife can be provided by planting odd areas to silky cornel, bayberry, coralberry, autumn-olive, and multiflora rose. Cleared areas are suited to pasture, but in most places clearing is not economical or practical. (Capability unit VIs-2; woodland group 12; building site group 6)

Papakating Series

The Papakating series consists of deep, very poorly drained soils that formed in recent alluvium deposited on nearly level flood plains. These soils lie along the small meandering streams of the county.

A typical Papakating soil has a 10-inch dark grayish-brown silty clay loam surface layer that is easily crumbled but is too wet to till. This layer is underlain by about 18 inches of mottled gray silty clay loam that is sticky, somewhat plastic, and very slowly permeable.

In many places the surface layer is mucky. In some places the substratum is sandy clay loam.

The Papakating soils formed from the same kind of alluvium as the poorly drained Holly soils and commonly are adjacent to them.

Papakating soils are strongly acid. Although the water table is high, only a small amount of moisture is available to plants. Where the water table can be lowered, these soils are suited to permanent hay or to pasture.

Papakating silty clay loam (0 to 3 percent slopes) (Pa).—This soil, the only Papakating soil mapped in the county, is described as typical of the series. Permanent hay, pasture, or row crops can be grown in areas where the water table is lowered by a system of bedding and drains, but birdsfoot trefoil, reed canarygrass, or other moisture-tolerant species should be seeded. Additions of lime and fertilizer increase the yield of forage. Constructing ponds and developing areas for wildlife should be considered. Plants that provide food and cover for wildlife are silky cornel and purple-osier willow. (Capability unit IVw-2; woodland group 4; building site group 11)

Pekin Series

The Pekin series consists of deep, moderately well drained or somewhat poorly drained soils that formed from mixed glacial outwash on nearly level and gently sloping terraces. These soils are principally along Huntington Creek and Fishing Creek. The Pekin soils in Columbia County are more cobbly than is normal for the series.

A typical cultivated Pekin soil has a dark-brown silt loam plow layer that is 8 inches thick and overlies about 8 inches of brown silt loam. This layer is about 10 percent gravel, is loose, and is easily tilled. The subsoil extends to a depth of about 40 inches and consists of mottled brown cobbly silty clay loam. It is slightly sticky and is tight enough to slow the movement of water. Few roots penetrate this layer, and there is very little air space. The substratum consists of stratified sand, gravel, and cobbles.

Depth to mottling ranges from 14 to 30 inches. Unconsolidated stratified material is at a depth of 3 to 5 feet, and bedrock is at 6 to 40 feet.

The Pekin soils commonly lie above Barber and Basher soils on flood plains and extend from near the streams to the shale hills.

Pekin soils are strongly acid in unlimed areas. They have moderately slow permeability and high moisture-holding capacity. Crops respond well to additions of lime and fertilizer. These soils are suited to most of the shallow-rooted crops grown in the county.

Pekin silt loam, cobbly variant, 0 to 3 percent slopes (PkA).—This is the soil described as typical of the Pekin series. Included in the mapping are small areas in which the drainage is poorer than normal. Graded strips are needed in all areas, and if they are used, row crops can be grown every year. Random closed drains are needed in the wettest areas. Lime and fertilizer should be applied frequently for favorable yields. (Capability unit IIw-3; woodland group 10; building site group 8)

Pekin silt loam, cobbly variant, 3 to 8 percent slopes, moderately eroded (PkB2).—This soil, the shallowest soil of the Pekin series in the county, has lost several inches of its original surface soil through erosion. Also, it has the most gravel in its plow layer.

If crops are seeded in graded strips, this soil is suitable for a cropping system in which hay is grown for 2 in every 5 years. By installing diversion terraces, runoff from higher areas is intercepted and the soil is protected from erosion. Lime and fertilizer should be applied frequently to maintain production. (Capability unit IIe-3; woodland group 10; building site group 8)

Ravenna Series

The Ravenna series consists of deep, poorly drained and somewhat poorly drained soils formed in Wisconsin glacial till that was derived from acid gray sandstone and shale. These soils occur in nearly level and gently sloping areas in the northeastern part of the county.

A typical cultivated Ravenna soil has a plow layer of very dark grayish-brown channery silt loam about 8 inches thick. This layer is frequently wet and is difficult to till. The subsoil, to a depth of about 40 inches, is mottled brownish-gray channery silty clay loam. The lower part of the subsoil is very firm and compact when moist. It is waterlogged much of the time and has very little air space. Few roots penetrate the lower subsoil. The substratum is gray channery clay loam that overlies sandstone bedrock.

In some places a thin layer of light olive-brown channery silt loam lies immediately beneath the plow layer. Depth to mottling ranges from 4 to 12 inches, and depth to bedrock ranges from about 4 to 6 feet.

The Ravenna soils formed from the same kind of glacial material as the moderately well drained Canfield soils and commonly occur in the same fields with them.

These soils are strongly acid in unlimed areas. They have slow permeability and moderate moisture-holding capacity. These soils are fairly well suited to shallow-rooted, moisture-tolerant crops.

Ravenna channery silt loam, 0 to 3 percent slopes (RaA).—This is the soil described as typical of the Ravenna series. If it is used for crops, a system of open drains or bedding is needed for good production. In some places installing random closed drains helps to dry out the soil so that it can be worked earlier in the spring. If the organic-matter content is maintained, a cropping system that provides 1 year of hay in every 3 years can be used. Diversion terraces are needed to intercept runoff from higher areas. Additions of lime and fertilizer help to insure satisfactory yields. Ponds can be built, but only dugout ponds are suitable in most places. (Capability unit IIIw-1; woodland group 14; building site group 10)

Ravenna channery silt loam, 3 to 8 percent slopes (RaB).—This soil is shallower than the soil described for the series. If the organic-matter content is maintained, a suitable cropping sequence is a row crop, a small grain, and hay. Open drains or drainage terraces are needed for good production, and random closed drains are effective in some places. Diversion terraces should be used to intercept runoff. Constructing ponds should be considered, especially where the surrounding areas can be developed for recreational uses. (Capability unit IIIw-1; woodland group 14; building site group 10)

Riverwash

Riverwash (Rw) consists of alluvial deposits of gravel, sand, silt, cobblestones, and anthracite coal flakes that are constantly shifting, and this shifting prevents development of a profile. The areas are on the islands and along the shores of the Susquehanna River. A few trees and shrubs are growing in some places. (Capability unit VIIIs-1; woodland group and building site group not assigned)

Shelmadine Series

The Shelmadine series consists of deep, poorly drained and somewhat poorly drained soils that formed in a variety of glacial materials on nearly level and gently sloping uplands. These soils are scattered throughout most of the county.

A typical cultivated Shelmadine soil has a brown silt loam plow layer that is 8 inches thick and contains a few fragments of shale. This layer is somewhat sticky and, during most of the year, is difficult to till. The subsoil extends to a depth of about 3 feet. The upper part is mottled olive-brown and gray silty clay loam that is tight and sticky and has very little air space. The lower subsoil is grayish silt loam that is dense and compact. Water moves slowly through this layer, and few roots penetrate for more than a few inches. The substratum is mottled dark-brown silty clay loam that is underlain by bedrock, generally at a depth of about 4 feet.

The subsoil ranges from silty clay loam to silty clay, and in some places it is shaly. Depth to mottling ranges from about 6 to 12 inches, and depth to the substratum ranges from about 28 to 40 inches.

The Shelmadine soils formed from the same kind of glacial material as did many of the better drained soils of the uplands, but they are commonly adjacent to the somewhat poorly drained Alvira soils.

Shelmadine soils are strongly acid in unlimed areas. They have slow permeability and moderate moisture-holding capacity. These soils are commonly wet, but they dry out and cake during long dry periods. They are not well suited to cultivated crops but are fairly well suited to permanent hay other than alfalfa.

Shelmadine silt loam, 0 to 3 percent slopes (SdA).—This is the soil described as typical of the Shelmadine series. It is the deepest Shelmadine soil in the county, for in many places it has received deposits from higher areas, and the surface layer extends below plow depth.

A cropping sequence of a row crop, a small grain, and hay can be used on this soil, but a better use is permanent hay. Birdsfoot trefoil mixed with grass does well. Open drains and random closed drains improve drainage so that the soil can be tilled and crops grown. Areas of this soil are suitable for building ponds. (Capability unit IVw-1; woodland group 15; building site group 10)

Shelmadine silt loam, 3 to 8 percent slopes, moderately eroded (SdB2).—This soil has lost about half of its original surface soil through erosion. Its present plow layer is finer textured and more shaly than that of the soil described for the series, for material from the subsoil has been mixed into it.

This soil has been used for cultivated crops, but a better use is permanent hay. A mixture of birdsfoot trefoil and grass is suitable for seeding. Open drains or drainage terraces improve the growing and harvesting of crops. Diversion terraces should be used to intercept runoff from higher areas. (Capability unit IVw-1; woodland group 15; building site group 10)

Shelmadine very stony silt loam (0 to 8 percent slopes) (Sh).—This soil has large stones on the surface and throughout the profile. All of it is in trees, which should be protected from fire. European larch and hemlock are suitable for planting in open areas. Food and cover for wildlife can be provided by planting silky cornel, autumn-olive, and multiflora rose. (Capability unit VIIs-3; woodland group 15; building site group 10)

Steep Very Stony Land

Steep very stony land (Sp) is in steep, very stony areas on escarpments and ridgetops. The areas consist almost entirely of large pieces of sandstone. Very little soil material is between the rocks, and the vegetation is sparse. (Capability unit VIIIs-1; woodland group and building site group not assigned)

Strip Mine Spoil

Strip mine spoil (St) consists of rubble heaps and deep trenches that have been left in areas that were strip mined. If they are leveled and smoothed, the areas can be planted to trees (fig. 6), but in their present condition they are suitable only for wildlife habitat. Suitable for planting or seeding are autumn-olive, silky cornel,

Figure 6.—**Strip mine spoil that has been smoothed and planted to pine trees. In the foreground trees, mostly aspen, have volunteered. In the background chestnut oak is growing on Edgemont very stony loam.**

Tatarian honeysuckle, multiflora rose, and lespedeza. (Capability unit VIIIs-1; woodland group and building site group not assigned)

Tioga Series

The Tioga series consists of deep, well-drained soils formed in alluvium that was deposited recently on nearly level and gently sloping flood plains. These soils occur along the major streams of the county.

A typical cultivated Tioga soil has an olive-brown silt loam plow layer that contains a little fine gravel and is 10 inches thick. This layer is loose and is easily tilled. It is underlain by stratified, well-drained material that ranges from silt loam to sandy clay loam. The substratum is stratified brown silt loam, sandy loam, sandy clay loam, silty clay loam, and gravel.

The texture and color of these soils vary widely according to the stratification and the variety of the material in the strata.

The Tioga soils formed from the same kind of alluvium as the moderately well drained Middlebury soils and commonly are with them on the same flood plains.

Tioga soils are acid in unlimed areas. They are moderately rapid to rapid in permeability and moderate to high in moisture-holding capacity. Crops respond well to additions of lime and fertilizer. These soils are suited to most crops commonly grown in the county. In some places winter wheat is damaged by flooding early in spring.

Tioga fine sandy loam (0 to 5 percent slopes) (Tf).—This soil has a coarser textured surface layer than the soil described as typical of the Tioga series, and it is more rapidly permeable. If farming is on the contour, row crops can be grown continuously. Under good management, which includes seeding a cover crop and adding large amounts of lime and fertilizer, satisfactory crop yields can be expected. This soil is sometimes flooded early in spring, but it dries in time for crops to be seeded. The cutting of streambanks is a problem in some places. (Capability unit I-2; woodland group 1; building site group 11)

Tioga gravelly loam, (0 to 3 percent slopes) (Tg).—This soil is coarser textured and contains more gravel than the soil described as typical of the Tioga series, and it is not so high in moisture-holding capacity. If this soil is farmed on the contour, row crops can be grown continuously. A winter cover crop should be seeded to protect the soil from scouring and to improve tilth. Additions of lime and fertilizer are needed to maintain production. High water from streams seldom covers this soil, and when it does, it does not damage crops. (Capability unit I-2; woodland group 1; building site group 11)

Tioga silt loam (0 to 3 percent slopes) (Ts).—This is the soil described as typical of the Tioga series. It is suitable for continuous row crops if it is farmed on the contour. Cover crops are needed to protect the soil and to maintain good tilth. If enough lime and fertilizer are added, satisfactory yields can be expected. This soil is occasionally flooded for short periods early in spring, but it dries before crops are damaged. The cutting of streambanks is a problem in some places. (Capability unit I-2; woodland group 1; building site group 11)

Tioga silt loam, high bottom (0 to 3 percent slopes) (Tt).—This soil is at a higher elevation than the soil described for the series, and it is flooded only about once in every hundred years. It is the deepest soil of the Tioga series in the county.

If this soil is farmed on the contour, row crops can be grown continuously. Satisfactory yields can be expected where large amounts of lime and fertilizer are added. (Capability unit I-2; woodland group 1; building site group 11)

Washington Series

The Washington series consists of deep, well-drained soils formed from limestone that is mixed with shale in most places. These nearly level to moderately sloping soils are in a band that extends in an east-west direction immediately north of the Susquehanna River.

A soil typical of the Washington series has a plow layer of dark-brown silt loam that is about 9 inches thick and is underlain by about 5 inches of yellowish-red silt loam and a few fragments of sandstone. The surface layer is easily crumbled and easily tilled. The subsoil extends to a depth of about 48 inches and consists of red silty clay loam. It is firm and slightly sticky. The subsoil is easily penetrated by roots, water, and air, for its structure is exceptionally good. The substratum is red gravelly loam about 1 foot thick. It is underlain by limestone.

In most places a thin mantle of windblown material is on the surface. The surface layer ranges from about 8 to 16 inches in thickness, depending mostly on the amount of material deposited by the wind. In some places the subsoil lies directly on the limestone bedrock. Depth to bedrock ranges from 4 to 8 feet.

The Washington soils formed from the same kind of material as the moderately well drained Wiltshire soils and commonly occur in the same fields with them.

Washington soils are acid at the surface in unlimed areas. They have moderate permeability and high moisture-holding capacity. Under good management, these soils produce satisfactory yields of all of the crops commonly grown in the county.

Washington silt loam, 0 to 3 percent slopes (WaA).—This is the soil described as typical of the Washington series. It is the deepest Washington soil in the county. Row crops can be grown continuously if contour tillage is used and cover crops are planted after the row crop is harvested. Cover crops help to protect the soil and to maintain the organic-matter content. (Capability unit I–1; woodland group 5; building site group 1)

Washington silt loam, 3 to 12 percent slopes, moderately eroded (WaB2).—This moderately eroded soil is steeper than the soil described as typical of the Washington series. Part of its original surface soil has been lost through erosion, and there is no mantle of windblown material.

On this soil a suitable cropping system is 2 years of row crops, 1 year of a small grain, and 1 year of hay if crops are grown in contour strips. By installing diversion terraces, runoff is intercepted and the soil is protected from erosion. This soil is suited to recreational sites that require a good cover of grass. (Capability unit IIe–1; woodland group 5; building site group 1)

Washington silt loam, 12 to 20 percent slopes, moderately eroded (WaC2).—This soil is steeper than the soil described as typical of the Washington series, and it has lost part of its original surface soil through erosion. Included in the mapping are small uneroded areas that have a mantle of silt on the surface, but most areas have little windblown material.

A cropping system that provides at least 2 years of hay in every 4 years can be used if this soil is farmed in contour strips. Diversion terraces are needed to intercept runoff and protect the soil from erosion. Natural drainageways should be kept in a permanent cover of grass. (Capability unit IIIe–1; woodland group 5; building site group 2)

Watson Series

The Watson series consists of deep, moderately well drained soils that formed from glaciated acid shale and sandstone on nearly level to moderately sloping uplands. These soils occur principally in the north-central part of the county.

A typical cultivated Watson soil has a dark grayish-brown silt loam plow layer about 9 inches thick. This layer contains a few small chips of shale, but it is fairly easy to crumble and to till. The subsoil is brown, shaly silty clay loam that is mottled at a depth of about 2 feet. In the lower 2 feet of subsoil, a dense compact layer restricts the movement of air and water. This dense layer extends to a depth of about 52 inches. The substratum is about 8 inches thick and consists of loose shale mixed with dark-brown silt loam. It is underlain by light olive-brown shale.

Depth to mottling ranges from 20 to 30 inches, and depth to hard shale ranges from 4 to 7 feet. Shale chips in the subsoil range from very few to as much as 30 percent of the soil mass.

The Watson soils formed from the same kind of material as the deep, well-drained Allenwood soils and the somewhat poorly drained Alvira soils and commonly occur in the same fields with them.

Watson soils are strongly acid in unlimed areas. They have moderately slow permeability and high moisture-holding capacity. These soils are suited to most of the crops grown in the county, but they should be carefully managed so as to avoid compaction.

Watson silt loam, 0 to 3 percent slopes (WbA).—This is the soil described as typical of the Watson series. It is the deepest Watson soil in the county, for in many places it has received deposits from higher areas.

A cropping system that provides 1 year of hay every 5 years can be used if the crops are planted in graded strips. A good program of liming and fertilizing is needed for producing satisfactory yields. Where outlets are available, random closed drains can be used for drainage. (Capability unit IIw–2; woodland group 10; building site group 8)

Watson silt loam, 3 to 8 percent slopes, moderately eroded (WbB2).—This soil has lost about half of its original surface soil through erosion. Its plow layer is somewhat finer textured than that of the soil described for the Watson series because material from the subsoil has been mixed into it. This mixing has reduced permeability and moisture-holding capacity.

Crops can be grown in graded strips if a cropping system is used that provides 2 years of hay in every 5 years and diversion terraces are constructed to protect the soil from erosion. The content of organic matter can be maintained by plowing under a cover crop. (Capability unit IIe–3; woodland group 10; building site group 8)

Watson silt loam, 8 to 15 percent slopes, moderately eroded (WbC2).—This soil is steeper than the soil described as typical of the Watson series, and it has lost about half of its original surface soil through erosion.

A cropping system that provides 2 years of hay in every 4 years can be used if this soil is farmed in graded strips. Diversion terraces are needed to intercept runoff and to protect the soil from erosion. Random closed drains should be used for draining wet spots. (Capability unit IIIe–2; woodland group 10; building site group 9)

Weikert Series

The Weikert series consists of shallow, well-drained soils that formed from sandstone or dark-colored acid shale on gently sloping to strongly sloping glaciated uplands. These soils are most commonly in the west-central part of the county, but they also occur on many scattered ridges in other parts.

A typical cultivated Weikert soil is moderately eroded and has a dark-brown channery silt loam plow layer about 7 inches thick. In most places this layer is so dry and channery that it cannot be tilled easily. It is underlain by a layer consisting of yellowish-brown silt loam and of coarse fragments that commonly make up 50 to 70 percent of the soil mass, by volume. The substratum is slightly weathered, dark-colored acid shale that becomes harder as depth increases. Depth to shale ranges from 6 to 12 inches.

The Weikert soils formed from the same kind of rock as the moderately deep, well-drained Berks soils and commonly are in the same fields with them.

Weikert soils are strongly acid in unlimed areas. They have moderately rapid permeability and low moisture-holding capacity. These soils generally produce fair yields of most of the crops commonly grown in the county, but there is danger of crop failure in dry periods.

These soils are suited to drought-resistant, deep-rooted crops.

Weikert channery silt loam, 3 to 12 percent slopes, moderately eroded (WcB2).—This soil is slightly deeper and contains more fragments of sandstone than the soil described as typical of the Weikert series.

If this soil is farmed in contour strips, crops can be grown in a cropping system that provides 2 years of hay in every 4 years. Diversion terraces intercept runoff, permit more moisture to enter the soil, and protect the soil from erosion. Fair yields can be obtained if adequate amounts of lime and fertilizer are added. (Capability unit IIIe-4; woodland group 16; building site group 5)

Weikert channery silt loam, 12 to 20 percent slopes, moderately eroded (WcC2).—This is the soil described as typical of the Weikert series. Included in the mapping are small wooded areas that are only slightly eroded.

This soil is suited to permanent hay, but the hay should be reseeded in contour strips when reseeding is needed. Diversion terraces intercept runoff and permit more moisture to enter the soil. Adequate amounts of lime and fertilizer are needed for favorable yields of forage. (Capability unit IVe-3; woodland group 16; building site group 6)

Weikert channery silt loam, 20 to 35 percent slopes, moderately eroded (WcD2).—Erosion has removed most of the original surface soil from this soil and has left hardly any material other than loose shale. This shale holds little moisture.

This soil is idle and grown over with weeds and briers. It is suitable as woodland, which can be established by planting white pine, red pine, European larch, and Norway spruce. Food and cover for wildlife can be provided by planting small areas to lespedeza, Tatarian honeysuckle, coralberry, and silky cornel. This soil can be used for improved pasture if contour furrows are used to increase infiltration and if drought-resistant forage plants are seeded. (Capability unit VIe-2; woodland group 17; building site group 6)

Weikert channery silt loam, 35 to 80 percent slopes, moderately eroded (WcF2).—This soil is much steeper than the soil described as typical of the Weikert series. Included in the mapping are some severely eroded areas and some areas that are slightly deeper than normal.

This soil has been cultivated, but most of the acreage is now idle or is in pasture. Pasture yields, however, are low because this soil is droughty. By installing contour furrows runoff is retarded, and the amount of water that enters the soil is increased. Suitable trees for planting are white pine, red pine, European larch, and Norway spruce. (Capability unit VIIe-1; woodland group 17; building site group 7)

Weikert very stony silt loam, 12 to 35 percent slopes (WeD).—Unlike the soil described as typical of the Weikert series, this soil is not eroded, and it has large pieces of sandstone on the surface and in the soil. The yellowish-brown silt loam surface layer generally is about 6 inches thick, but in some places the soil material extends into the cracks of the rock for several feet. In most places the bedrock is sandstone.

Most areas of this soil are wooded and are not eroded. Trees should be protected from fire and grazing and selectively cut for sustained yields. Fair pasture could be produced in areas that are cleared, but clearing is not practical in most places. (Capability unit VIs-2; woodland group 16; building site group 6)

Weikert very stony silt loam, 35 to 80 percent slopes (WeF).—Many large pieces of sandstone and bedrock crop out in most areas of this steep and very steep soil. All areas are wooded and are not eroded. This soil should be kept in trees and protected from fire. Small areas can be improved for wildlife habitat. (Capability unit VIIs-1; woodland group 17; building site group 7)

Wellsboro Series

The Wellsboro series consists of deep, moderately well drained and somewhat poorly drained soils formed from Wisconsin glacial till that was derived from acid red shale and sandstone. These soils are in areas of gently sloping and moderately sloping uplands in the northeastern part of the county.

A typical cultivated Wellsboro soil is moderately eroded and has a dark-brown channery silt loam plow layer about 7 inches thick. This layer is easily crumbled and, except in wet periods, is easily tilled. The subsoil is reddish-brown loam. It extends to a depth of about 4 feet and is mottled below a depth of 2 feet. The upper subsoil is easily penetrated by water, roots, and air, but few roots penetrate into the mottled zone. The substratum consists of dusky-red silty clay loam and of gravel that make up about 70 percent of the layer. It is underlain by red shale or sandstone.

Depth to mottling ranges from about 15 to 30 inches, and depth to bedrock ranges from about 3 to 5 feet. In many places a seepy layer occurs just above the pan.

The Wellsboro soils formed from the same kind of material as the deep, well-drained Lackawanna soils and the poorly drained Morris soils and commonly are in the same fields with them.

Wellsboro soils are strongly acid in unlimed areas. These soils are moderately permeable and are moderately high in moisture-holding capacity. They are well suited to the shallow-rooted crops commonly grown in the county.

Wellsboro channery silt loam, 3 to 8 percent slopes, moderately eroded (WfB2).—This is the soil described as typical of the Wellsboro series. Crops can be grown in graded strips in a cropping system that provides for 2 years of hay in every 5 years. By constructing diversion terraces runoff is intercepted and the soil is protected from erosion. Random closed drains may be needed for draining wet spots. Lime and fertilizer are needed to obtain favorable yields. (Capability unit IIe-3; woodland group 10; building site group 8)

Wellsboro channery silt loam, 8 to 15 percent slopes, moderately eroded (WfC2).—This strongly sloping soil has better surface drainage than the soil described as typical of the Wellsboro series, and it usually dries out a little earlier in spring. It can be farmed in graded strips if the cropping system lasts 4 years and provides for 2 years of hay. A permanent cover of grass is needed in natural drainageways. Diversion terraces intercept runoff and protect the soil from erosion. (Capability unit IIIe-2; woodland group 10; building site group 9)

Wellsboro very stony silt loam, 0 to 8 percent slopes (WhB).—This soil, unlike the one described as typical of the Wellsboro series, is wooded and has a thin layer of

silty humus and a mat of leaves on the surface. Large pieces of sandstone are in the soil and on the surface.

This soil is suited as woodland, which should be protected from fire and grazing. Open areas can be planted to Norway spruce, European larch, white pine, and red pine. Food and cover for wildlife are provided by planting autumn-olive, purple-osier willow, Tatarian honeysuckle, and bayberry. Clearing is practical in only a few places, but cleared areas are suited to pasture. (Capability unit VIs–3; woodland group 10; building site group 8)

Westmoreland Series

The Westmoreland series consists of deep, well-drained soils that formed from glaciated, limy dark-gray shale. These soils are in areas of gently sloping and moderately sloping uplands, principally in the west-central part of the county.

A typical cultivated Westmoreland soil has a grayish-brown silt loam plow layer that contains a few fragments of shale and is 9 inches thick. This layer is easily crumbled and easily tilled. The subsoil, to a depth of about 40 inches, is strong-brown to yellowish-red silty clay loam. It is slightly sticky but is easily penetrated by roots, moisture, and air. The substratum is dark-gray limy shale that reacts with acid in deep cuts. The shale gradually becomes harder as depth increases, but in its upper few inches, it is weathered, and a few thin films are on the fragments.

The subsoil ranges from shaly silt loam to shaly silty clay. Depth to shale ranges from 3 to 5 feet. In many places dark-colored acid shale is interbedded in the substratum, and in these places the subsoil is more strongly acid than is typical of Westmoreland soils.

The Westmoreland soils formed from the same kind of dark-colored limy shale as the shallow and moderately deep, well drained Litz soils and the moderately well drained Wiltshire soils. All of these soils commonly are in the same fields.

In unlimed areas, Westmoreland soils are strongly acid at the surface but are almost neutral in the lower subsoil. In these soils permeability is moderately slow and moisture-holding capacity is high. These soils are suited to the crops commonly grown in the county, and they produce favorable yields if management is good.

Westmoreland silt loam, 3 to 12 percent slopes, moderately eroded (WmB2).—This is the soil described as typical of the Westmoreland series. In a few places lenses of faintly mottled material occur in the lower subsoil.

On this soil crops can be grown if contour strips are used and the cropping system provides hay every fourth year. By installing diversion terraces, runoff is intercepted and the soil is protected from erosion. The few seepy spots that occur can be drained by random closed drains. (Capability unit IIe–1; woodland group 12; building site group 1)

Westmoreland silt loam, 12 to 20 percent slopes, moderately eroded (WmC2) —This soil is steeper and shallower than the soil described as typical of the Westmoreland series. Included in the mapping are small severely eroded areas.

On this soil crops can be grown if contour strips are used and the cropping system provides hay for at least 2 years in every 4 years. A permanent cover of grass is needed in natural drainageways. Diversion terraces are needed to intercept runoff and to protect the soil from erosion. (Capability unit IIIe–1; woodland group 12; building site group 2)

Wiltshire Series

The Wiltshire series consists of deep, moderately well drained soils formed in material that weathered mostly from limestone. These soils are in nearly level to moderately sloping areas immediately north of the terraces along the Susquehanna River.

A typical cultivated Wiltshire soil has a dark grayish-brown silt loam plow layer about 8 inches thick. This layer is easily crumbled and is fairly easy to till. The subsoil, to a depth of about 18 inches, is yellowish-brown silty clay loam that is easily crumbled when dry and is sticky when wet. Below a depth of 18 inches, the subsoil is gray silty clay loam or silty clay mottled with strong brown. This layer is firm and sticky, and restricts the movement of water and the growth of roots. A dense, compact layer is in the subsoil at a depth of 20 to 30 inches. Limestone bedrock is at a depth of more than 40 inches.

Fine chips of shale make up 15 percent of the surface layer in some places. In some places a thin mantle of silt and very fine sand covers the surface of these soils. Where they occur with the Belmont soils, Wiltshire soils are redder throughout the profile than the soil described and have many small pieces of calcareous red shale in their subsoil. Depth to mottling ranges from 15 to 30 inches.

The Wiltshire soils formed from the same kind of material as the deep, well-drained Washington soils and commonly are in the same fields with them. In some places the Wiltshire soils are adjacent to the deep, well-drained Belmont soils that formed in calcareous red shale.

The Wiltshire soils are medium acid in unlimed areas, but they are only slightly acid in the lower subsoil. They have moderately slow permeability and high moisture-holding capacity. Crops respond well to additions of lime and fertilizer. These soils are well suited to most of the shallow-rooted crops commonly grown in the county.

Wiltshire silt loam, 0 to 3 percent slopes (WnA).—This is the soil described as typical of the Wiltshire series. It is the deepest Wiltshire soil in the county, for it has received deposits from higher areas and, in most places, is only slightly eroded. Included in the mapping are some areas that are moderately shallow.

Crops can be grown in graded strips in a cropping system that lasts 5 years and provides 1 year of hay. A good program of liming and fertilization should be maintained. Diversion terraces may be needed to intercept runoff from higher areas, and random closed drains can be used for draining wet spots. Closed drains are difficult to install in the moderately shallow areas. (Capability unit IIw–2; woodland group 7; building site group 8)

Wiltshire silt loam, 3 to 8 percent slopes, moderately eroded (WnB2).—This soil is not so deep as the soil described as typical of the Wiltshire series, and it contains less organic matter and more coarse fragments in the

plow layer. Included in the mapping are some areas that are moderately shallow to shale.

A cropping system that provides hay for 2 years in every 5 can be used on this soil if crops are planted in graded strips, if organic-matter content is maintained, and if a good program of liming and fertilization is followed. Careful management is needed so as to prevent compaction during wet periods. On long slopes, diversion terraces are needed to intercept runoff. (Capability unit IIe–3; woodland group 7; building site group 8)

Wiltshire silt loam, 8 to 15 percent slopes, moderately eroded (WnC2).—This moderately eroded soil is steeper and shallower than the soil described as typical of the Wiltshire series, and it has more coarse fragments in the plow layer.

Crops can be grown on this soil if the cropping system provides hay for 2 years in every 4, if graded strips are used, and if a good program of liming and fertilization is followed. Diversion terraces are needed to control excess water and to reduce erosion. A permanent cover of grass will protect the natural depressions. (Capability unit IIIe–2; woodland group 7; building site group 9)

Wooster Series

The Wooster series consists of deep well-drained soils formed from Wisconsin glacial till that was derived from acid gray sandstone and shale. These soils are in areas of gently sloping to strongly sloping uplands in the northeastern part of the county.

A typical cultivated Wooster soil has a dark-grayish brown silt loam plow layer about 7 inches thick. Except for the stone fragments, this layer is easily crumbled. Also, it is easily tilled. The subsoil is yellowish-brown channery silt loam that contains slightly more clay than the surface layer. This layer is uniform to a depth of about 40 inches. It is porous enough to permit the growth of roots and the movement of air and water. Below a depth of about 40 inches, a dense, compact layer tends to restrict the movement of water and the growth of roots. The substratum consists of yellowish-brown channery silty clay and of fragments of sandstone that make up most of the soil mass. Sandstone bedrock is at a depth of about 60 inches.

The subsoil is channery silt loam and channery silty clay loam. Depth to bedrock ranges from 4 to 8 feet. A thick layer of coarse sand overlies the bedrock in some places.

Wooster soils formed from the same kind of glacial material as the shallow and moderately deep, well drained Lordstown soils and the moderately well drained Canfield soils and commonly occur in the same fields with those soils.

Wooster soils are strongly acid in unlimed areas. They have moderate permeability and moisture-holding capacity. Crops respond well to additions of lime and fertilizer. These soils are suited to all of the crops commonly grown in the county.

Wooster channery silt loam, 3 to 12 percent slopes, moderately eroded (WoB2).—This is the soil described as typical of the Wooster series. Included in the mapping are narrow bands of an uneroded soil along hedgerows and above stone fences.

Full use can be made of this soil if the hedgerows and fences are removed, the fields are laid out in contour strips, and a cropping system is used that provides for hay every fourth year. Diversion terraces are probably needed to intercept runoff. Heavy applications of lime and fertilizer insure favorable yields. (Capability unit IIe–1; woodland group 5; building site group 1)

Wooster channery silt loam, 12 to 20 percent slopes, moderately eroded (WoC2).—This moderately eroded soil is steeper and shallower than the soil described as typical of the Wooster series. Included in the mapping are narrow bands of an uneroded soil above stone fences.

Full use can be made of this soil if the stone fences are removed and the fields are laid out in contour strips. Also needed are diversion terraces that intercept runoff and protect the soil from erosion. A suitable cropping system provides at least 2 years of hay in every 5 years. Natural drainageways can be protected by a permanent cover of grass. (Capability unit IIIe–1; woodland group 5; building site group 2)

Wooster channery silt loam, 20 to 35 percent slopes, moderately eroded (WoD2).—This moderately eroded, steep soil is shallower than the soil described for the series. Included in the mapping are small severely eroded areas where rills and small gullies have been cut.

This soil is suited to permanent hay, which should be reseeded in contour strips. Large amounts of lime and fertilizer are needed to maintain lush growth. In pastures contour furrows help to retard runoff and permit more moisture to enter the soil. Runoff should be intercepted where the construction of diversions is feasible. (Capability unit IVe–4; woodland group 6; building site group 2)

Wooster very stony silt loam, 12 to 35 percent slopes (WpD).—A thin cover of leaves and humus and large blocks of sandstone are on the surface of this soil. Blocks of sandstone also occur in the soil. Most of this soil is wooded. The trees should be protected from fire and grazing and, for sustained yelds, should be selectively cut. Food and cover for wildlife can be provided by planting multiflora rose, Tatarian honeysuckle, bayberry, and autumn-olive. Although good pasture is produced where this soil is cleared, clearing is practical in only a few areas. (Capability unit VIs–1; woodland group 5; building site group 4)

Wooster and Canfield very stony loams, 0 to 12 percent slopes (WsB).—The entire acreage of these very stony soils is wooded. A thin layer of humus and decaying leaves is on the surface. Also on the surface, and in the soil as well, are large blocks of sandstone. The surface layer consists of about 9 inches of very dark grayish brown silt loam.

These soils are suitable for pasture, trees, and wildlife habitat. The trees should be protected from fire and grazing and, for sustained yields, should be selectively cut. Interplanting open areas with European larch, red pine, white pine, or black locust is a good practice. (Capability unit VIs–1; woodland group 5; building site group 3)

Zipp Series

The Zipp series consists of deep, poorly drained and very poorly drained soils that formed from lime-influenced sediments on nearly level terraces and in old lake beds. These sediments are mainly in the drainage basin of Briar Creek.

A typical cultivated Zipp soil has an 8-inch plow layer of grayish-brown silt loam that is wet for much of the

year and is somewhat difficult to till. The subsoil is gray silty clay loam that is mottled with yellowish red and reddish yellow. It extends to a depth of about 40 inches. The subsoil is also wet for much of the year, for water moves slowly through it. Also, very few roots penetrate the subsoil. The substratum is made up of gravel, other gritty material, and a small amount of silt loam. The pieces of gravel, largely fine-grained sandstone, are mostly less than 1 inch across.

Except for the rust streaks along root channels, mottling is not evident in the plow layer in most places, but it may occur at any depth between the surface and about 12 inches. Depth to the substratum ranges from about 36 to 44 inches.

Zipp soils formed from the same kind of calcareous sediments as some of the somewhat poorly drained Alvira soils and commonly occur in the same fields with those soils.

Zipp soils are medium acid at the surface in unlimed areas, but they are neutral in the subsoil. They have slow permeability and moderate moisture-holding capacity. Under good management, these soils are suited to the shallow-rooted crops commonly grown in the county.

Zipp silt loam (0 to 3 percent slopes) (Zp).—This is the soil described as typical of the Zipp series. If a system of open drains or bedding is used on this soil, a suitable cropping sequence is a row crop, a small grain, and hay, but care must be taken to avoid the compaction that is a result of using heavy equipment while the soil is wet. In some places random tile is useful. Runoff from higher areas should be diverted from this soil. (Capability unit IIIw-2; woodland group 11; building site group 10)

Formation and Classification of Soils

In this section, the formation of the soils in Columbia County is described in terms of the five main factors of soil formation. Then the soil series in the county are placed in their respective great soil groups, according to the old system of classification, and in subgroups according to the current system. The great soil groups and soil series in the county are described. For each soil series, a detailed description of a profile representative of the series is included.

Formation of Soils

Soils are complex mixtures of weathered rocks, minerals, organic matter, water, and air that occur in varying proportions. The soils were formed through the chemical and physical weathering of the parent rock. The extent of this weathering and the characteristics of any soil that develops depend on (1) the nature of the parent rock, (2) the kind of climate, (3) the relief, or lay of the land, (4) the plant and animal life in and on the soil, and (5) the time these factors have affected development.

In a small area like Columbia County where vegetation and climate vary little, the nature of the parent rock strongly influences the texture and mineral content of the soil. Climate influences the nature of the weathering processes. Relief affects drainage, aeration, runoff, erosion, and exposure to sun and wind. Plant and animal life influence soil characteristics by both physical and chemical extractions and additions. The interaction of these factors constantly changes the soils, though long periods of time are required for the changes to become apparent.

Parent material

The soils of Columbia County formed primarily from shale, siltstone, sandstone, quartzite, and limestone. Many of them formed from mixtures consisting of these rocks in varying proportions. Fine-textured soils formed primarily from limestone or shale. The Washington soils, for example, formed primarily from limestone, and the Watson and Albrights soils formed primarily from shale. The Dekalb and Edgemont soils formed primarily from sandstone and quartzite; they have coarse texture and contain very hard coarse fragments. Higher in bases than soils formed from acid shale are the Belmont and Westmoreland soils, which formed from calcareous shale, and the Washington soils, which formed from limestone. Soils formed from sandstone and quartzite are very low in bases.

To a large extent, the coarse-textured soils formed from sandstone and quartzite in the mountainous areas of the county. Medium-textured soils formed from mixtures of sandstone, siltstone, and acid shale in the rolling hills and valleys. Examples are the Leck Kill and Hartleton soils. Soils developed from limestone and calcareous shale are in the area immediately north of the outwash terraces along the North Branch of the Susquehanna River.

Climate

Compared with the erratic, extremely cold climate of the glacial period, the climate of today in the county is uniform, warm, and humid. At the close of the glacial period, intense freezing and thawing shattered the shale that now underlies the Berks, Hartleton, Leck Kill, Weikert, and other soils in the county. The weathering of this parent rock was thus hastened. As the glaciers receded, the climate became more humid and more temperate, and it strongly affected the development of the soils. The soils that developed are strongly leached, strongly acid or very strongly acid, and low in natural fertility. Examples of soils of this kind in the county are the Allenwood, Laidig, Albrights, Edgemont, and Watson.

Relief

Relief depends, to a large extent, on the nature of the underlying rock. In a landscape the highest ridges are formed where the rocks are most resistant to weathering. Relief affects the exposure of the rock to forces of wind, sun, and water, and the weathering of the rock greatly depends on these forces. It is hard to determine how much weathering is resisted by the parent rock and how much it is hastened by the forces of wind, sun, and water. We do know, however, that relief, by its effect on surface drainage, indirectly controls internal drainage, leaching, and geologic erosion. Where topography

is nearly level, silt and clay accumulate and impede internal drainage, as they have in the Zipp, Shelmadine, and Holly soils. On the steeper slopes, runoff is greater, and soil material is washed away almost as fast as it is formed from the parent material. In this county the Klinesville, Weikert, Oquaga, and other shallow soils formed on the steeper slopes where much of the soil material has been carried away by geologic erosion.

Plant and animal life

Hardwood trees have had more effect on the development of the soils in Columbia County than have any other kind of plants or any kind of animal life. The effects of the plants, however, have been rather uniform throughout the county, though species of plants do vary. The acids that formed from decaying leaf litter have helped to hasten the leaching of nutrients from the soils and the development of leached A2 horizons that can be seen in the Allenwood, Braceville, Lawrenceville, and other soils. The effect of animal life is hard to determine, but it is known that many forms of animals contribute to the mixing of soil material and are responsible for large additions of organic matter. Man has little effect on the past development of soils in the county. The most noticeable effect of his activity is the accelerated erosion that has been a result of improper use of the soils. Through tillage, artificial drainage, irrigation, and other practices, man will have a great effect on the future development of soils in areas where these practices are used.

Time

Time is needed so that each of the other interacting factors can exert its influence in the formation of soils. Most of the soils in the county formed in old glacial till and are well developed. Soils in the northeastern part of the county are less well developed because they formed in Wisconsin glacial till, which is only about 11,000 years old. Slightly younger than the soils that formed in the northeastern part of the county are the Chenango, Braceville, and similar soils on terraces. The Barbour, Basher, and other soils that formed on the flood plains are so young that they show little development of the profile.

Classification of Soils

Soils are placed in narrowly defined classes so that knowledge about their behavior within farms and counties can be organized and applied. They are placed in broadly defined categories so that large areas, such as continents, can be studied and compared.

Two systems of natural classification of soils are now in general use in the United States. One of these systems is described in the "1938 Yearbook of Agriculture" and in later revisions of the system (*3*, *12*). The other, a completely new system, was placed in general use by the Soil Conservation Service at the beginning of 1965. The reader who is particularly interested in the current system should search the literature (*10*, *16*). Modifications in the system are made as knowledge of soils increases.

The older system has six categories. In the highest of these, soils of the whole county have been placed in three classes of one category, the soil order. The next two categories, the suborder and family, have not been fully developed and, therefore, have not been used much. Attention has centered on the categories great soil group, soil series, and soil type. A great soil group consists of soils that have about the same general sort of profile but that may differ greatly in slope, thickness of profile, and other characteristics. The categories soil series, soil type, and a subdivision of the type called the soil phase, have been defined in the section "How This Survey Was Made."

The current system of soil classification was developed by soil scientists of the Soil Conservation Service, assisted by their colleagues in the United States and in foreign countries. This comprehensive system was needed because of the shortcomings of the older system that were apparent when soils were classified in foreign countries and for interpretations in new fields of use.

Like the older system, the current system has six categories. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series (*10*). In this system the criteria used as a basis for classification are soil properties that are observable or measurable. The properties are chosen, however, so that soils of similar genesis, or mode of origin, are grouped together.

In the order of the current classification, soils are grouped according to common properties that seem to be the result of the same kinds of processes acting to about the same degree on soil material and forming horizons. Each order is subdivided into suborders, primarily on the basis of chemical or physical properties that reflect degree of wetness, differences that are the result of climate and vegetation, and extremes of texture. Each great group is defined within its respective suborder according to the presence or absence of diagnostic horizons and the arrangement of these horizons. Subgroups can be defined only in terms of reference to a great group and may represent the central concept of the great group or reflect properties that intergrade toward other classes. Soils are grouped in families largely on the basis of properties important to plant growth.

Listed in table 9 for each soil series in Columbia County are the great soil group of the older system of classification and the subgroup of the current system. To those familiar with the current system, the name of the subgroup indicates the order and the great group. The families of the current system are not indicated in table 9, because the family classification at this time is uncertain and may change as additional information is accumulated.

Great Soil Groups in Columbia County

In this subsection, the great soil groups represented in Columbia County are described and the soil series in each group are named. A great soil group is a broad group consisting of soils that have fundamental characteristics in common.

TABLE 9.—*Soil series classified according to great soil group of 1938 classification and subgroup of current classification*

Series	1938 classification great soil group	Current classification
		Subgroup
Albrights	Gray-Brown Podzolic (intergrading toward Red-Yellow Podzolic)	Aquic Fragiudalfs.
Allenwood	Red-Yellow Podzolic	Typic Hapludults.
Allis	Low-Humic Gley	Aeric Haplaquepts.
Alvira	Red-Yellow Podzolic (intergrading toward Low-Humic Gley)	Aquic Fragiudults.
Atherton	Low-Humic Gley	Mollic Haplaquepts.
Barbour	Alluvial	Cumulic Dystrochrepts.
Basher	Alluvial	Aquic Cumulic Dystrochrepts.
Belmont	Gray-Brown Podzolic	Typic Hapludalfs.
Berks	Sols Bruns Acides (intergrading toward Lithosols)	Typic Dystrochrepts.
Braceville	Sols Bruns Acides	Unclassified.[1]
Buchanan	Red-Yellow Podzolic	Aquic Fragiudults.
Calvin	Sols Bruns Acides	Typic Dystrochrepts.
Canfield	Gray-Brown Podzolic	Aquic Fragiudalfs.
Chenango	Sols Bruns Acides	Typic Dystrochrepts.
Dekalb	Sols Bruns Acides	Typic Dystrochrepts.
Duncannon	Gray-Brown Podzolic	Alfic Hapludults.
Edgemont	Gray-Brown Podzolic (intergrading toward Red-Yellow Podzolic)	Typic Hapludults.
Hartleton	Gray-Brown Podzolic (intergrading toward Red-Yellow Podzolic)	Alfic Hapludults.
Holly	Low-Humic Gley	Cumulic Haplaquepts.
Klinesville	Sols Bruns Acides (intergrading toward Lithosols)	Lithic Dystrochrepts.
Lackawanna	Sols Bruns Acides	Typic Fragiochrepts.
Laidig	Red-Yellow Podzolic	Typic Fragiudults.
Lawrenceville	Gray-Brown Podzolic	Aquic Fragiudults.
Leck Kill	Gray-Brown Podzolic (intergrading toward Red-Yellow Podzolic)	Typic Hapludults.
Lickdale	Humic Gley	Typic Umbraquults.
Litz	Red-Yellow Podzolic (intergrading toward Lithosols)	Alfic Hapludults.
Lordstown	Sols Bruns Acides	Typic Dystrochrepts.
Middlebury	Alluvial	Aquic Cumulic Haplorthents.
Morris	Sols Bruns Acides (intergrading toward Low-Humic Gley)	Aeric Fragiaquepts.
Oquaga	Sols Bruns Acides (intergrading toward Lithosols)	Lithic Dystrochrepts.
Papakating	Humic Gley	Typic Humaquepts.
Pekin	Gray-Brown Podzolic (intergrading toward Red-Yellow Podzolic)	Unclassified.[1]
Ravenna	Gray-Brown Podzolic (intergrading toward Low-Humic Gley)	Aeric Fragiaqualfs.
Shelmadine	Low-Humic Gley	Typic Fragiaqualfs.
Tioga	Alluvial	Cumulic Haplorthents.
Washington	Gray-Brown Podzolic (intergrading toward Red-Yellow Podzolic)	Alfic Hapludults.
Watson	Red-Yellow Podzolic	Typic Fragiudults.
Weikert	Sols Bruns Acides (intergrading toward Lithosols)	Lithic Dystrochrepts.
Wellsboro	Sols Bruns Acides	Typic Fragiochrepts.
Westmoreland	Gray-Brown Podzolic (intergrading toward Red-Yellow Podzolic)	Alfic Hapludults.
Wiltshire	Gray-Brown Podzolic (intergrading toward Red-Yellow Podzolic)	Typic Fragiudalfs.
Wooster	Gray-Brown Podzolic	Typic Fragiudalfs.
Zipp	Humic Gley	Mollic Ochraqualfs.

[1] Classification not determined at time of publication.

Gray-Brown Podzolic soils

In undisturbed areas, typical Gray-Brown Podzolic soils have a surface layer of dark humus that is 1 to 2 inches thick and is underlain by a leached, grayish layer, or A horizon, 6 to 8 inches thick. The B horizon has definitely more clay than the A horizon, but in its lower part it becomes lighter in color and coarser in texture as it grades to the C horizon. The C horizon is partly weathered. The leaching of bases has been only moderate in Gray-Brown Podzolic soils. These soils have a base saturation that is normally higher than 35 percent. They produce well if they are properly fertilized, and they are suited to most crops. In Columbia County, typical Gray-Brown Podzolic soils are in the Belmont, Canfield, Duncannon, Lawrenceville, and Wooster series.

Some Gray-Brown Podzolic soils intergrade toward Low-Humic Gley soils. In Columbia County only the Ravenna soils are of this kind. They have a sequence of horizons and base exchange characteristics similar to those of Gray-Brown Podzolic soils, but as in Low-Humic Gley soils, their subsoil horizons are mottled and gleyed because drainage is poor.

In Columbia County some Gray-Brown Podzolic soils intergrade toward Red-Yellow Podzolic soils. These intergrades resemble the soils in both great soil groups in sequence of horizons, depth of solum, color, and degree of textural and structural development. They are, however, intermediate between Gray-Brown Podzolic soils and Red-Yellow Podzolic soils in weathering and leaching of bases. They are more acid than typical Gray-Brown Podzolic soils and are less acid than typical Red-Yellow Podzolic soils. In Columbia County these intergrades are in the Albrights, Edgemont, Hartleton, Leck Kill, Pekin, Washington, Westmoreland, and Wiltshire series.

Red-Yellow Podzolic soils

Typical Red-Yellow Podzolic soils have a thin A1 horizon, a thicker, light-colored, leached A2 horizon, and a thick, red, yellowish-red, or yellowish-brown B horizon. Clay and sesquioxides have accumulated in the B horizon. Red-Yellow Podzolic soils generally have developed in siliceous parent material. They are normally strongly weathered and low in base saturation. Base saturation is normally below 35 percent. Soils in this group are strongly acid. In Columbia County typical Red-Yellow Podzolic soils are in the Allenwood, Buchanan, Laidig, and Watson series.

Some Red-Yellow Podzolic soils intergrade toward Low-Humic Gley soils. In Columbia County only the Alvira soils are of this kind. Alvira soils are similar to Red-Yellow Podzolic soils in horizon sequence and degree of weathering, but their mottled gray B horizon is similar to the B horizon of Low-Humic Gley soils. The mottles are a result of restricted subsoil drainage.

Red-Yellow Podzolic soils that grade to Lithosols are in the Litz series. They are considered intergrades to Lithosols because in some places they are on strong slopes, are shallow over the underlying rock, and do not have a strongly developed profile.

Low-Humic Gley soils

Typical Low-Humic Gley soils have a thin, dark-colored surface layer that is moderately high in organic-matter content. The subsoil is usually mottled gray and brown and differs little from the surface layer in texture. The subsoil may contain a fragipan, which is a tight layer restricting the movement of water. Low-Humic Gley soils developed in areas that have a fluctuating high water table and are poorly drained or somewhat poorly drained. They are generally too wet for favorable production of crops, but under good management, they are suited to forage crops. Typical Low-Humic Gley soils in Columbia County are in the Allis, Atherton, Holly, and Shelmadine series.

Humic Gley soils

Typical Humic Gley soils have a thick, very dark gray or black surface layer and a gray, mottled subsoil. These soils are poorly drained or very poorly drained. Organic matter has accumulated at the surface because the soils are waterlogged much of the time. Aeration is very poor, and reduction rather than oxidation occurs. By this reduction, iron compounds become soluble and may escape in seepage water. Unless they are artificially drained, these soils are too wet for crop production. In Columbia County typical Humic Gley soils are in the Lickdale, Papakating, and Zipp series.

Sols Bruns Acides

Typical Sols Bruns Acides have a thin A1 horizon and an A2 horizon that is poorly differentiated from the A1 horizon. The A2 horizon is underlain by a B horizon that has uniform color, weak to moderate structure, and little, if any, accumulation of silicate clay. In some places, however, there are thin, discontinuous clay films in pores and on ped surfaces. Some Sols Bruns Acides have a fragipan. In these soils, some clay may have accumulated, and the base saturation is higher in the fragipan than in overlying horizons. Sols Bruns Acides are generally not so productive as the Red-Yellow Podzolic soils or the Gray-Brown Podzolic soils, but fair yields can be obtained if they are properly fertilized. In Columbia County typical Sols Bruns Acides are in the Braceville, Calvin, Chenango, Dekalb, Lackawanna, Lordstown, and Wellsboro series.

Some Sols Bruns Acides intergrade toward Low-Humic Gley soils. In Columbia County only Morris soils are of this kind. The profile of Morris soils is similar to that of typical Sols Bruns Acides. Except in the fragipan, the B horizon of Morris soils has little or no clay accumulation. Because of the fragipan, drainage is poor and the B horizon is mottled and gray throughout. The mottling and gray colors are characteristic of Low-Humic Gley soils.

In Columbia County some Sols Bruns Acides intergrade toward Lithosols. These intergrades resemble Sols Bruns Acides in most characteristics. They have a uniformly colored profile and little or no accumulation of clay in the B horizon. Like Lithosols, however, they are shallow to bedrock and have a high content of coarse fragments. In Columbia County Sols Bruns Acides that intergrade toward Lithosols are in the Berks, Klinesville, Oquaga, and Weikert series.

Alluvial soils

Typical Alluvial soils have weakly expressed horizons. These soils have formed in sediments laid down in successive periods of flooding. They normally have an A horizon in which some organic matter has accumulated. Differences in color and texture in the layers below the A horizon are generally attributed to stratification rather than soil development. In some places Alluvial soils are mottled as a result of the fluctuating high water table. Alluvial soils are productive, but there is a hazard of flooding. In Columbia County typical Alluvial soils are in the Barbour, Basher, Middlebury, and Tioga series.

Technical Descriptions of Soil Series

This subsection was prepared for those who need more information about the soils in the county than is given elsewhere in the report. Following a general description of the soil series, a profile of a soil typical of the series is described. This profile was studied at a specified location in the county. In the section "Descriptions of the Soils," other information about each soil series is given, as well as a description of all the soils of that series that were mapped in the county.

ALBRIGHTS SERIES

The Albrights series consists of deep, moderately well drained and somewhat poorly drained soils formed from pre-Wisconsin glacial till that was derived from acid red shale and sandstone. These soils are on nearly level to moderately sloping uplands in most of the county except in the extreme northern and southern parts. They are Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils. Albrights soils are moderately well drained and somewhat poorly drained members of the drainage sequence that includes the shallow, well-drained Klinesville soils and the moderately deep, well-

drained Leck Kill soils. Associated with this catena are the poorly drained and somewhat poorly drained Shelmadine soils and the very poorly drained Lickdale soils. Albrights soils are similar to Wellsboro soils, which formed from similar material of Wisconsin age, but the Albrights soils are more weathered than the Wellsboro and, in most places, contain fewer coarse fragments in the subsoil. The forest on Albrights soils consisted of mixed hardwoods and some pine and hemlock, but most areas have been cleared and are used for crops and pasture.

Profile of Albrights gravelly silt loam in nearly level woodland about 2 miles east of Summer Hill:

O2—2 inches to 0, very dark gray (10YR 3/1) organic duff containing many fine roots and mycelia; abrupt, wavy boundary; 1 to 2 inches thick.

A1—0 to 5 inches, reddish-brown (5YR 5/4) gravelly silt loam; 15 to 20 percent of horizon is coarse fragments; moderate, medium, granular structure; friable when moist; plentiful roots; strongly acid (pH 5.2); abrupt, smooth boundary; 4 to 6 inches thick.

B1—5 to 9 inches, light reddish-brown (5YR 6/4) gravelly silt loam; 15 to 20 percent of horizon is coarse fragments; moderate, fine, subangular blocky structure; firm when moist, slightly sticky when wet; plentiful roots; strongly acid (pH 5.1); clear, wavy boundary; 3 to 6 inches thick.

B2—9 to 19 inches, yellowish-red (5YR 5/6) gravelly silty clay loam; 15 to 20 percent of horizon is coarse fragments; moderate, medium, blocky structure; thin, continuous clay films on ped surfaces; firm when moist, slightly sticky when wet; plentiful roots; strongly acid (pH 5.1); clear, wavy boundary; 8 to 12 inches thick.

Bx1—19 to 32 inches, yellowish-red (5YR 5/6) gravelly clay loam; 15 to 20 percent of horizon is coarse fragments; many, medium, distinct mottles of pinkish white (5YR 8/2); moderate, medium, blocky structure; thin, continuous clay films on ped surfaces; very firm when moist, sticky and plastic when wet; few roots; strongly acid (pH 5.1); clear, smooth boundary; 11 to 14 inches thick.

Bx2—32 to 40 inches, reddish-brown (5YR 4/3) gravelly clay loam; 40 to 50 percent of horizon is coarse fragments; many, medium, distinct mottles of pinkish white (5YR 8/2); weak, coarse, subangular blocky structure tending towards massive; thin, discontinuous clay films on stones; very firm when moist; few roots; very strongly acid (pH 5.0); abrupt, wavy boundary; 7 to 9 inches thick.

C—40 to 60 inches, reddish-brown (5YR 4/3) very gravelly clay loam; 60 to 70 percent of horizon is coarse fragments of red shale and sandstone; common, medium, prominent mottles of light gray (N 7/0); structureless (massive); very firm when moist; very strongly acid (pH 5.0).

In cultivated areas, the Ap horizon is made up of material of the O2, A1, and B1 horizons. The coarse fragments in the upper horizons are subangular, but the Bx and C horizons contain many angular fragments of shale. Depth to mottling ranges from about 14 to 30 inches. Gray mottles generally occur just above the pan. Depth to the C horizon ranges from about 35 to 45 inches, and depth to bedrock is normally more than 6 feet.

ALLENWOOD SERIES

The Allenwood series consists of deep, well-drained soils formed from pre-Wisconsin till that was derived from acid yellow shale and sandstone. These soils are in nearly level to moderately sloping areas, mostly in the north-central part of the county. They are typical Red-Yellow Podzolic soils. Allenwood soils are the deep, well drained members of the catena that includes the shallow, well drained Weikert soils, the moderately deep, well drained Hartleton soils, the moderately well drained Watson soils, the somewhat poorly drained Alvira soils, and the poorly drained Shelmadine soils. The very poorly drained Lickdale soils occur with this catena. Allenwood soils are similar to Wooster soils, which formed from similar till of Wisconsin age, but they are generally finer textured in the B horizon. Also, they contain fewer coarse fragments, show more weathering, and have redder hues in the subsoil. Allenwood soils were covered with mixed hardwoods, but they have been cleared and are used for crops.

Profile of Allenwood silt loam in a nearly level cultivated field 4 miles northwest of Rohrsburg:

Ap—0 to 8 inches, brown (10YR 4/3) silt loam containing a few coarse fragments; weak, very fine, granular structure; very friable when moist; plentiful roots; has been limed; neutral (pH 6.6); abrupt, wavy boundary; 7 to 9 inches thick.

A2—8 to 13 inches, yellowish-brown (10YR 5/4) light silty clay loam containing a few coarse fragments; moderate, thin, platy structure breaking to moderate, fine, granular structure; friable when moist, sticky and plastic when wet; plentiful roots; strongly acid (pH 5.2); clear, wavy boundary; 4 to 6 inches thick.

B1—13 to 18 inches, brown (7.5YR 5/4) light silty clay loam containing a few coarse fragments; moderate, fine and medium, subangular blocky structure; thin, discontinuous clay films on ped surfaces; slightly firm when moist, sticky and plastic when wet; plentiful roots; very strongly acid (pH 4.8); clear, wavy boundary; 4 to 6 inches thick.

B21—18 to 25 inches, yellowish-red (5YR 5/6) silty clay loam containing a few coarse fragments; moderate, medium, subangular blocky structure; thin, discontinuous clay films on ped surfaces; slightly firm when moist, sticky and plastic when wet; few roots; very strongly acid (pH 4.8); clear, wavy boundary; 6 to 9 inches thick.

B22—25 to 33 inches, yellowish-red (5YR 5/6) silty clay loam; 5 to 10 percent of horizon is coarse fragments; weak, medium, platy structure breaking to moderate, fine and medium, subangular blocky structure; thin, continuous clay films on ped surfaces; slightly firm when moist, sticky and plastic when wet; few roots; very strongly acid (pH 5.0); clear, wavy boundary; 7 to 10 inches thick.

B23—33 to 43 inches, yellowish-red (5YR 4/6) silty clay loam; 5 to 10 percent of horizon is coarse fragments; moderate, medium and thick, platy structure; thin, continuous clay films on ped surfaces; firm when moist, sticky and plastic when wet; no roots; very strongly acid (pH 5.0); clear, wavy boundary; 9 to 12 inches thick.

B24—43 to 60 inches, yellowish-red (5YR 4/6) light silty clay loam; 5 to 10 percent of horizon is coarse fragments; weak, thin and medium, platy structure; thin, discontinuous clay films on ped surfaces; very firm when moist, sticky and plastic when wet; very strongly acid (pH 5.0); more than 16 inches thick.

C—60 inches +, reddish-brown (5YR 4/4) very gritty gravel; some pieces are coated with black.

The B2 horizons range from 7.5YR to 2.5YR in hue and from 3 to 6 in chroma. The hue of the C horizon ranges from 7.5YR to 5YR. In many places the subsoil contains many coarse fragments. Black coatings are common on coarse fragments. The lower B horizon is blocky in many places. Depth to the C horizon ranges from about 40 to 80 inches.

ALLIS SERIES

The Allis series consists of shallow to moderately deep, somewhat poorly drained and poorly drained soils developed in glacial till that was derived from dark-colored calcareous shale. These soils are on nearly level and gently sloping till plains, mainly near Jerseytown. They are Low-Humic Gley soils. Allis soils occur with the shallow to moderately deep, well drained Litz soils, the deep, well drained Westmoreland soils, and the moderately well drained Wiltshire soils. They are similar to Alvira soils but are not nearly so deep. The forest cover was mixed hardwoods, but most areas have been cleared and are used for crops.

Profile of Allis silt loam in nearly level cropland 2 miles west of Jerseytown:

Ap—0 to 6 inches, light brownish-gray (10YR 6/2) silt loam containing a few coarse fragments; weak, medium, granular structure; friable when moist; plentiful roots; strongly acid (pH 5.1); abrupt, smooth boundary; 5 to 7 inches thick.

Blg—6 to 9 inches, light-gray (2.5Y 7/2) shaly silty clay loam; 10 to 20 percent of horizon is coarse fragments; weak, fine, granular structure; thin, discontinuous clay films on ped surfaces; friable when moist; few roots; strongly acid (pH 5.2); clear, wavy boundary; 2 to 3 inches thick.

B21—9 to 13 inches, pale-yellow (2.5Y 8/4) silty clay; 5 to 10 percent of horizon is coarse fragments; many, coarse, distinct mottles of brownish yellow (10YR 6/8); moderate, medium, subangular blocky structure; thick, continuous clay films on ped surfaces; firm when moist, sticky when wet; few roots; strongly acid (pH 5.2); gradual, irregular boundary; 3 to 6 inches thick.

B22—13 to 19 inches, pale-yellow (2.5Y 8/4) very shaly silty clay loam; 60 to 70 percent of horizon is coarse fragments; many, coarse, distinct mottles of brownish yellow (10YR 6/8); moderate, thin, platy structure; thick, discontinuous clay films on ped surfaces and on stones; firm when moist, sticky when wet; gradual, irregular boundary; 4 to 7 inches thick.

B3—19 to 21 inches, lenses of pale-yellow (2.5Y 8/4) clay; 5 to 10 percent of horizon is coarse fragments; many, coarse, distinct mottles of brownish yellow (10YR 6/8); moderate, medium, subangular blocky structure; thick, continuous clay films on ped surfaces; firm when moist, sticky when wet; few roots; strongly acid (pH 5.2); gradual, broken boundary; 0 to 3 inches thick.

R—21 inches +, very dark gray (10YR 3/1) shale with some clay on upper surfaces.

Depth to mottling ranges from 6 to 12 inches. Light-gray mottles in streaks are common throughout the profile. In most places the lower B horizon is only slightly acid. In most places below the B22 horizon, the clay lenses described are absent. Depth to shale ranges from 14 to 24 inches. The shale is harder and more alkaline as depth increases, and in most places it reacts to added acid at a depth of less than 3 feet.

ALVIRA SERIES

The Alvira series consists of deep, somewhat poorly drained soils formed from pre-Wisconsin glacial till that was derived from acid gray sandstone, siltstone, and shale. These soils are on gently sloping and moderately sloping till plains, mainly in the north-central part of the county. They are Red-Yellow Podzolic soils that intergrade toward Low-Humic Gley soils. Alvira soils have a distinct fragipan at a depth of about 28 inches. They are somewhat poorly drained and commonly occur with the shallow, well drained Weikert soils, the moderately deep, well drained Hartleton soils, the deep, well drained Allenwood soils, the moderately well drained Watson soils, the poorly drained Shelmadine soils, and the very poorly drained Lickdale soils. Alvira soils are finer textured but contain more coarse fragments than the Canfield soils and are more poorly drained and more acid. The native vegetation is mainly hemlock, beech, and maple, but most areas have been cleared and are used for pasture and crops.

Profile of Alvira shaly silt loam in a moderately sloping cultivated field 1¾ miles northeast of Rohrsburg (Laboratory No. S59Pa-19-10-(1-9) in tables 10 and 11):

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) shaly silt loam; about 20 percent of horizon is coarse fragments; weak, fine, granular structure; friable when moist; neutral (pH 6.9); abrupt, wavy boundary; 8 to 10 inches thick.

B1—9 to 14 inches, yellowish-brown (10YR 5/6) gritty shaly silt loam; about 30 percent of horizon is coarse fragments; weak, fine and medium, subangular blocky structure; thin, discontinuous clay films on the peds; friable when moist, sticky when wet; medium acid (pH 5.8); clear, wavy boundary; 4 to 7 inches thick.

B21—14 to 20 inches, yellowish-brown (10YR 5/6) gritty shaly silty clay loam; about 30 percent of horizon is coarse fragments; common, medium, faint mottles of yellowish brown (10YR 5/6), pale brown (10YR 6/3), and light brownish gray (2.5Y 6/2); moderate, medium, subangular blocky structure; prominent but etched clay films on peds; friable to firm when moist, sticky when wet; strongly acid (pH 5.2); clear, wavy boundary; 5 to 7 inches thick.

B22—20 to 29 inches, yellowish-brown (10YR 5/4) gritty shaly silty clay loam; about 40 percent of horizon is coarse fragments; common, medium, distinct mottles of dark yellowish brown (10YR 4/4), pale brown (10YR 6/3), and light brownish gray (2.5Y 6/2); weak blocky structure breaking to weak, fine, blocky structure; distinct, discontinuous clay films on peds; firm when moist, sticky when wet; strongly acid (pH 5.1); clear, wavy boundary; 6 to 12 inches thick.

Bx1—29 to 32 inches, yellowish-brown (10YR 5/4) gritty shaly silt loam; 40 to 50 percent of horizon is coarse fragments; common, medium, distinct mottles of dark yellowish brown (10YR 4/4), light brownish gray (2.5Y 6/2), and pale brown (10YR 6/3); blocky structure breaking to moderate, fine, blocky structure and weak, thin, platy structure; thick but discontinuous clay films and reddish-brown coats on peds; firm when moist sticky when wet; very strongly acid (pH 5.0); abrupt, wavy boundary; 2 to 5 inches thick.

Bx2—32 to 37 inches, dark yellowish-brown (10YR 4/4) gritty very shaly silt loam; about 60 percent of horizon is coarse fragments; many, medium, prominent mottles of gray (5Y 6/1) and strong brown (7.5YR 5/8); weak blocky structure breaking to weak, medium, blocky structure and to slightly platy structure; thick discontinuous clay films and a few manganese coats on peds; firm when moist, sticky when wet; strongly acid (pH 5.2); clear, wavy boundary; 4 to 6 inches thick.

Bx3—37 to 45 inches, gritty very shaly loam; about 60 percent of horizon is coarse fragments; equal distribution of many, medium and coarse prominent mottles of yellowish brown (10YR 5/8), strong brown (7.5YR 5/6), and gray (5Y 6/1); weak blocky structure breaking to weak, thin and medium, platy structure; thick discontinuous clay films and many

manganese coats on peds; firm when moist, sticky when wet; strongly acid (pH 5.2); clear, wavy boundary; 6 to 10 inches thick.

B31—45 to 50 inches, yellowish-brown (10YR 5/6) gritty very shaly loam; about 60 percent of horizon is coarse fragments; common, medium, prominent mottles of dark yellowish brown (10YR 4/4) and gray (5Y 6/1); weak, fine, blocky structure; few clay films on peds; firm to friable when moist, sticky when wet; fossiliferous ghosts of limestone; strongly acid (pH 5.3); abrupt, wavy boundary; 4 to 6 inches thick.

B32—50 inches +, yellowish-brown (10YR 5/6) shaly silt loam; about 15 percent of horizon is coarse fragments; common, medium, distinct mottles of grayish brown (10YR 5/2) and strong brown (7.5YR 5/8); weak, fine, blocky structure and weak, medium platy structure; few clay films on peds; friable when moist; not sticky but plastic when wet; some fossiliferous ghosts of limestone; strongly acid (pH 5.3).

Profile of Alvira shaly silt loam in a gently sloping, moderately eroded cultivated field three-quarters of a mile southwest of Rohrsburg (Laboratory No. S59Pa-19-5-(1-8) in tables 10 and 11):

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) shaly silt loam; about 20 percent of horizon is coarse fragments; weak, fine, granular structure; friable when moist; abundant roots; has been limed; neutral (pH 6.8); abrupt, smooth boundary; 9 to 11 inches thick.

B21—10 to 13 inches, yellowish-brown (10YR 5/4) shaly silty clay loam; about 20 percent of horizon is coarse fragments; moderate, medium, subangular blocky structure; thin, discontinuous clay films on ped surfaces; friable when moist, slightly sticky when wet; few roots; medium acid (pH 5.6); clear, wavy boundary; 2 to 4 inches thick.

B22—13 to 18 inches, yellowish-brown (10YR 5/6) shaly silty clay loam; 35 percent of horizon is coarse fragments; common, medium, faint mottles of light brownish gray (10YR 6/2) and brownish yellow (10YR 6/6); moderate, medium, subangular blocky structure; thin, discontinuous clay films on ped surfaces; friable when moist, slightly sticky and plastic when wet; few roots; medium acid (pH 5.8); clear, wavy boundary; 4 to 6 inches thick.

B23—18 to 22 inches, strong-brown (7.5YR 5/6) shaly silt loam; 20 to 30 percent of horizon is coarse fragments; many, medium, distinct mottles of dark yellowish brown (10YR 4/4), yellowish brown (10YR 5/6), and gray (5Y 6/1); moderate, medium, blocky structure; thin, discontinuous clay films on ped surfaces; firm when moist, slightly sticky and plastic when wet; few roots; medium acid (pH 5.6); gradual, wavy boundary; 3 to 6 inches thick.

Bx1—22 to 32 inches, strong-brown (7.5YR 5/6) shaly silt loam; 20 to 30 percent of horizon is coarse fragments; many, medium, distinct mottles of dark brown (7.5YR 4/4) and light gray (5Y 7/1); coarse blocky structure breaking to weak, thin, platy structure; thin, discontinuous clay films and manganese coatings on ped surfaces; firm when moist, slightly sticky and slightly plastic when wet; few roots; very strongly acid (pH 5.0); clear, wavy boundary; 8 to 12 inches thick.

Bx2—32 to 42 inches, strong-brown (7.5YR 5/6) shaly silt loam; 20 to 30 percent of horizon is coarse fragments; common, medium, prominent mottles of gray (5Y 6/1) and dark brown (7.5YR 4/4); coarse blocky structure breaking to moderate, medium, platy structure; thick, discontinuous clay films and manganese coatings on ped surfaces; firm when moist, slightly sticky and plastic when wet; no roots; very strongly acid (pH 5.0); gradual, wavy boundary; 8 to 12 inches thick.

Bx3—42 to 51 inches, strong-brown (7.5YR 5/6) shaly silt loam; 30 to 40 percent of horizon is coarse fragments; common, medium, prominent mottles of dark brown (7.5YR 4/4) and gray (5Y 6/1); coarse blocky structure breaking to weak, thin, platy structure; thin, discontinuous clay films and manganese coatings on ped surfaces; firm when moist, slightly sticky and plastic when wet; very strongly acid (pH 5.0); abrupt, wavy boundary; 7 to 11 inches thick.

C—51 to 60 inches +, strong- brown (7.5YR 5/6) very shaly silt loam; 50 to 60 percent of horizon is coarse fragments; many, medium, distinct mottles of gray (5Y 6/1), reddish yellow (7.5YR 6/8), and yellowish brown (10YR 5/6); strong, coarse, blocky structure breaking to weak, coarse, blocky structure and to weak, thin, platy structure; friable when moist, slightly sticky and slightly plastic when wet; very strongly acid (pH 4.9); more than 9 inches thick.

Depth to mottling ranges from about 10 to 20 inches. The hue of the matrix is 7.5YR or 10YR. The texture of the subsoil includes silt loam, light silty clay loam, loam, and clay loam. Coarse fragments in the subsoil make up about 5 to 40 percent of the soil mass. The Alvira soils in the nearly level to gently sloping areas along the headwaters of the West Branch of Briar Creek and near Jerseytown contain fewer coarse fragments in the upper horizon, are higher in reaction, and are less eroded than most of the Alvira soils.

ATHERTON SERIES

The Atherton series consists of moderately deep and deep, very poorly drained to somewhat poorly drained soils that formed in stratified material on nearly level glacial terraces, principally along the North Branch of the Susquehanna River. These Low-Humic Gley soils are the poorly drained members of the drainage sequence that includes the deep, well drained Chenango soils and the moderately well drained and somewhat poorly drained Braceville soils. Atherton soils are similar to Zipp soils in drainage but are more acid, coarser textured, and normally not so deep to the C horizon. The native vegetation consisted principally of blackgum and hemlock, but most areas are now idle and overgrown with cattails, goldenrod, and water-tolerant shrubs.

Profile of Atherton loam in a nearly level idle area 1 mile east of Bloomsburg:

Ap—0 to 12 inches, dark-gray (10YR 4/1) loam containing a few coarse fragments; common, fine, prominent mottles of red (2.5YR 4/6); weak, fine, subangular blocky structure; friable when moist; many roots; medium acid (pH 5.7); clear, wavy boundary; 10 to 13 inches thick.

B2g—12 to 28 inches, gray (5YR 6/1) fine sandy loam containing a few coarse fragments; many, fine and medium, prominent mottles of strong brown (7.5YR 5/6); weak, fine, subangular blocky structure; slightly firm when moist, slightly sticky when wet; no roots; medium acid (pH 5.7); clear, wavy boundary; 15 to 17 inches thick.

C1g—28 to 33 inches, gray (N 5/0) sandy clay containing a few coarse fragments; common, fine, prominent mottles of reddish yellow (7.5YR 6/6); structureless (massive); very firm when moist, slightly sticky when wet; medium acid (pH 5.7); generally more than 5 inches thick.

C2—33 inches + stratified sand and gravel.

In places the upper part of the B2 horizon has weak, thick, platy structure. Depth to the C horizon ranges from about 26 to 40 inches. Where the C horizon is at a depth greater than normal, the B horizon grades grad-

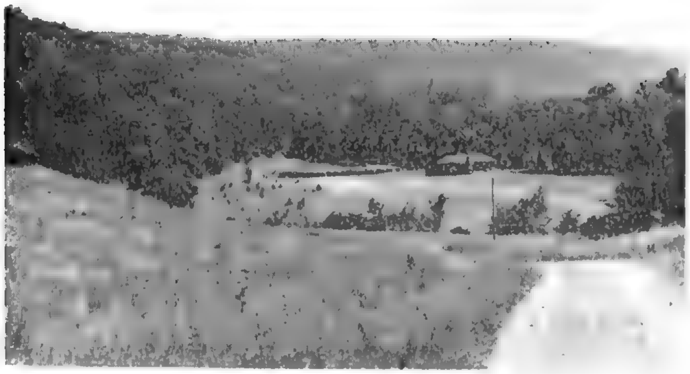

Figure 7.—**The Boy Scout Camp is on Barbour fine sandy loam. The terrace in the foreground is Chenango gravelly sandy loam, and the hills are Lackawanna and Oquaga very stony soils and Lordstown very stony silt loam.**

ually from fine sandy loam to sandy loam. In some places the sandy clay Cg horizon is replaced by sand and gravel. The C horizon is slightly firmer and less sticky than the fine sandy loam B horizon.

BARBOUR SERIES

The Barbour series consists of deep, well-drained Alluvial soils that formed from recent deposits of sand, silt, and clay on nearly level and gently sloping flood plains, principally along upper Fishing Creek (fig. 7). These soils are well drained members of the catena that includes the moderately well drained and somewhat poorly drained Basher soils, the poorly drained and somewhat poorly drained Holly soils, and the very poorly drained Papakating soils. Barbour soils are similar to Tioga soils but are more red and normally contain more gravel. The forest cover is mostly mixed hardwoods and some hemlock, but most areas have been cleared and are used for crops.

Profile of Barbour gravelly loam in a nearly level cultivated field 2 miles south of Benton:

Ap—0 to 11 inches, dark reddish-brown (2.5YR 3/4) gravelly loam; 30 to 40 percent of horizon is coarse fragments; moderate, medium, granular or blocky structure; friable when moist; plentiful roots; has been limed; neutral (pH 6.8); clear, wavy boundary; 10 to 12 inches thick.

AC—11 to 17 inches, reddish-brown (5YR 4/3) gravelly loam; 30 to 40 percent of horizon is coarse fragments; coarse, blocky structure breaking to weak, fine, subangular blocky structure; friable when moist; few roots; medium acid (pH 5.6); gradual, wavy boundary; 3 to 9 inches thick.

C—17 to 40 inches +, dark reddish-brown (5YR 3/4) gravel; structureless (single grain); thin, discontinuous clay films on upper surface of gravel; no roots.

The surface layer is fine sandy loam, gravelly loam, or silt loam. Areas of silt loam and fine sandy loam are more extensive than areas of gravelly loam. Lenses of material that contrasts with the material in a normal profile in texture and color are common. Depth to gravel, sand, or both, is normally more than 2 feet. Most Barbour soils are on high bottoms, but they have the same typical profile as the soils in more frequently flooded areas.

BASHER SERIES

The Basher series consists of deep, moderately well drained and somewhat poorly drained soils that formed on nearly level flood plains, principally along Fishing Creek and its tributaries. These Alluvial soils are moderately well drained and somewhat poorly drained members of the catena that includes the deep, well drained Barbour soils, the poorly drained and somewhat poorly drained Holly soils, and the very poorly drained Papakating soils. Basher soils are similar to the Middlebury soils but have redder hues throughout the profile. The forest cover consists principally of red oak, white oak, and maple, but most areas have been cleared and are cultivated.

Profile of Basher fine sandy loam in a nearly level wooded area 2 miles southeast of the village of Central:

O2—1 inch to 0, partly decomposed pine needles; 1 to 2 inches thick.

A1—0 to 9 inches, dusky-red (2.5YR 3/2) fine sandy loam containing a few coarse fragments; weak, fine, granular structure; friable when moist; plentiful roots; has been limed; neutral (pH 7.0); clear, wavy boundary; 7 to 10 inches thick.

AC—9 to 23 inches, reddish-brown (2.5YR 5/4) fine sandy loam; 5 to 10 percent of horizon is coarse fragments; structureless (single grain) but tends to have weak, coarse, prismatic structure; loose when moist; plentiful roots; has been limed; neutral (pH 7.2); abrupt, smooth boundary; 12 to 15 inches thick.

C1—23 to 28 inches, red (2.5YR 4/6) sandy loam; 5 to 10 percent of horizon is coarse fragments; many, fine, faint mottles of pale red (2.5YR 6/2); structureless (massive in place, but single grain where disturbed); firm when moist, loose in disturbed areas; no roots; slightly acid (pH 6.3); abrupt, smooth boundary; 5 inches thick.

C2—28 to 36 inches +, red (2.5YR 4/6) loamy sand; 10 to 15 percent of horizon is coarse fragments; many, fine, faint mottles of pale red (2.5YR 6/2); structureless (single grain); firm when moist; strongly acid (pH 5.5); more than 8 inches thick.

Depth to mottling ranges from about 15 inches where Basher soils grade toward the Holly soils to about 30 inches where they grade toward the Barbour soils. Lenses of material contrasting with the material in a normal profile in texture and color are common.

BELMONT SERIES

The Belmont series consists of deep, generally well-drained soils that formed from calcareous red shale on gently sloping and moderately sloping hills. These Gray-Brown Podzolic soils are immediately north of the terraces along the North Branch of the Susquehanna River. They occur with the shallow, well-drained Calvin soils that have a neutral substratum. Small areas are moderately well drained and occur with areas of Wiltshire soils. Belmont soils are similar to Leck Kill and Lackawanna soils, both of which formed from acid red shale and sandstone. The forest cover was probably mixed hardwoods, but the entire area has been cleared and is used for crops.

Profile of Belmont silt loam in gently sloping cropland 4 miles east of Light Street:

Ap—0 to 6 inches, light reddish-brown (5YR 6/3) silt loam containing a few coarse fragments; weak, fine,

granular structure; very friable when moist; plentiful roots; slightly acid (pH 6.2); abrupt, smooth boundary; 5 to 7 inches thick.

B1—6 to 11 inches, reddish-brown (2.5YR 4/4) silty clay loam; 10 to 20 percent of horizon is coarse fragments; moderate, fine, subangular blocky structure; friable when moist, slightly sticky when wet; few roots and many old root channels; strongly acid (pH 5.4); clear, wavy boundary; 4 to 6 inches thick.

B21—11 to 20 inches, weak-red (10R 4/4) silty clay loam; 10 to 20 percent of horizon is coarse fragments; moderate, fine, subangular blocky structure; thin, discontinuous clay films on ped surfaces; firm when moist, sticky when wet; no roots, but many old root channels; strongly acid (pH 5.4); gradual, wavy boundary; 7 to 11 inches thick.

B22—20 to 28 inches, weak-red (10R 5/3) shaly silty clay loam; 30 to 40 percent of horizon is coarse fragments; moderate, medium, subangular blocky structure; thin, discontinuous clay films on ped surfaces; fine manganese coatings on shale fragments; very firm when moist, sticky when wet; no roots or root channels; strongly acid (pH 5.4); gradual, wavy boundary; 6 to 10 inches thick.

B23—28 to 36 inches, weak-red (10R 4/4) heavy shaly silty clay loam; 30 to 40 percent of horizon is coarse fragments; strong, fine, subangular blocky structure; firm when moist, slightly sticky when wet; medium acid (pH 5.6); clear, wavy boundary; 7 to 10 inches thick.

B3—36 to 42 inches, dusky-red (10R 3/4), gritty shaly sandy clay loam; 30 to 40 percent of horizon is coarse fragments; weak, fine, subangular blocky structure; firm when moist; medium acid (pH 5.8); more than 6 inches thick.

C—42 to 50 inches, weathered calcareous red shale.

In many places Belmont soils are covered by a mantle of windblown silt 4 to 15 inches thick. This material is like that in which the Lawrenceville and Duncannon soils formed. Where the mantle is thick, the Ap and A2 horizons have a hue of 10YR, and the A3 horizon is similar to the Ap horizon of the profile described. Depth to the C horizon is generally more than 40 inches, but in some places, particularly on the steeper slopes, it is less than 3 feet. In the lower B horizon moderate blocky structure is common. The lower B horizon and the C horizon range from medium acid to neutral.

BERKS SERIES

The Berks series consists of moderately deep, well-drained soils that formed from thin-bedded, dark-colored acid shale on gently sloping to strongly sloping till plains. These soils are principally near Millville and Rohrsburg in Madison and Greenwood Townships. They are Sols Bruns Acides intergrading toward Lithosols. Berks soils occur with the shallow, well drained Weikert soils, the deep, well drained Allenwood soils, and the moderately well drained Watson soils. Berks soils are less red than the Leck Kill soils, which formed from acid, red shale. The forest is mainly mixed oaks, but most areas of these soils have been cleared and are used for crops.

Profile of Berks shaly silt loam in a moderately sloping area of a 20-year-old pine plantation 1 mile west of Millville:

Ap1—0 to 3 inches, dark-brown (7.5YR 3/2) shaly silt loam; 15 to 20 percent of horizon is coarse fragments; weak, fine, granular structure; friable when moist; plentiful roots; slightly acid (pH 6.1); clear, smooth boundary; 2 to 4 inches thick.

Ap2—3 to 8 inches, pale-brown (10YR 6/3) shaly silt loam; 20 to 30 percent of horizon is coarse fragments; weak, fine, granular structure; friable when moist; plentiful roots; strongly acid (pH 5.2); clear, smooth boundary; 4 to 6 inches thick.

B21—8 to 15 inches, very pale brown (10YR 7/3), gritty shaly silt loam; 40 to 50 percent of horizon is coarse fragments; weak, fine, granular structure; friable when moist, slightly sticky when wet; plentiful roots; strongly acid (pH 5.2); clear, wavy boundary; 5 to 9 inches thick.

B22—15 to 22 inches, pink (7.5YR 8/4), gritty very shaly silt loam; 50 to 60 percent of horizon is coarse fragments; weak, fine, subangular blocky structure; friable when moist, slightly sticky when wet; few roots; strongly acid (pH 5.2); clear, wavy boundary; 6 to 9 inches thick.

C—22 to 30 inches, very dark gray (5YR 3/1) shale that is black when shattered; pink (7.5YR 7/4) clay films on the upper surface of fragments; shale makes up to 95 percent of horizon; clear, wavy boundary; 6 to 9 inches thick.

R—30 inches +, dark-colored hard shale.

The B horizon ranges from olive yellow to strong brown. In some places shale shows traces of weathering and of clay films at a depth of 4 feet. In cultivated areas the Ap horizon is not subdivided. It is strong-brown shaly silt loam that has an abrupt, smooth boundary. Coarse fragments make up 10 to 40 percent of the A horizon. In most places the B horizon is skeletal and includes coarse fragments that make up 50 to 70 percent or more of the horizon, by volume. Depth to bedrock ranges from about 20 to 30 inches.

BRACEVILLE SERIES

The Braceville series consists of deep, moderately well drained and somewhat poorly drained soils that formed from glacial outwash of sand and gravel. These soils are on nearly level and gently sloping terraces, principally along the Susquehanna River. They are Sols Bruns Acides. Braceville soils occur with the deep, well-drained Chenango soils and the very poorly drained to somewhat poorly drained Atherton soils. Braceville soils are coarser textured and more stratified than Pekin soils. The forest cover was mixed hardwoods, but the areas of Braceville soils have been cleared and are used for crops.

Profile of Braceville loam in a nearly level cultivated field 1 mile east of Mifflinville:

Ap—0 to 8 inches, dark yellowish-brown (10YR 4/4) loam containing some gravel; weak, fine, granular structure; friable when moist; plentiful roots; has been limed; slightly acid (pH 6.3); abrupt, smooth boundary; 8 to 9 inches thick.

A2—8 to 11 inches, yellowish-brown (10YR 5/6) loam containing some gravel; weak, thin, platy structure breaking to moderate, fine granular structure; friable when moist; plentiful roots; slightly acid (pH 6.3); clear, wavy boundary; 2 to 4 inches thick.

B1—11 to 16 inches, yellowish-brown (10YR 5/4) loam containing some gravel; weak, medium, granular structure; friable when moist, slightly sticky when wet; plentiful roots; medium acid (pH 5.6); clear, wavy boundary; 4 to 6 inches thick.

B21—16 to 22 inches, yellowish-brown (10YR 5/4) fine sandy loam; 10 to 20 percent of horizon is fine gravel; many, fine, faint mottles of light yellowish brown (10YR 6/4); weak, thick, platy structure breaking to moderate, medium, subangular blocky structure; firm when moist; few roots; medium acid (pH 5.6); clear, wavy boundary; 5 to 7 inches thick.

B22—22 to 29 inches yellowish-brown (10YR 5/4) fine sandy loam; 10 to 20 percent of horizon is fine gravel; many, fine, faint mottles of yellowish brown (10YR 5/6) and light olive brown (2.5Y 5/6); weak, medium, granular structure; firm when moist; few roots; medium acid (pH 5.6); clear, wavy boundary; 6 to 8 inches thick.

B23—29 to 34 inches, yellowish-brown (10YR 5/6) fine sandy loam; 10 to 20 percent of horizon is fine gravel; few, fine, faint mottles of light olive brown (2.5Y 5/6); structureless (massive in place, single grain if disturbed); firm in place, loose when moist if disturbed; few roots; medium acid (pH 5.6); clear, wavy boundary; 4 to 6 inches thick.

C1—34 to 40 inches +, dark grayish-brown (10YR 4/2) gravelly sandy loam; about 50 percent of horizon is gravel consisting of fine-grained sandstone and various erratics; somewhat stratified; few roots; medium acid (pH 5.6); over 6 inches thick.

The B horizon ranges from silt loam to sandy loam. Depth to mottling ranges from 14 to 30 inches. The C horizon is at a depth of 18 to 40 inches, and bedrock normally is at a depth of more than 30 feet. Coarse fragments consist almost entirely of fine gravel, but there are some cobbles below a depth of 30 inches.

BUCHANAN SERIES

The Buchanan series consists of deep, moderately well drained and somewhat poorly drained soils that formed in mixed colluvium on gentle slopes at the base of steep mountains. These soils are in the Red-Yellow Podzolic great soil group. Buchanan soils occur with the deep, well-drained Laidig soils and formed from similar parent material. They also occur with pockets of very poorly drained Lickdale soils. Buchanan soils have a fragipan and have more cobbles and blocky sandstones throughout the profile than Braceville soils, which occur on alluvial terraces. Buchanan soils are finer textured in the C horizon than Braceville soils. They are wooded in most places, but a few small areas are used for pasture. The forest consists of oak, maple, beech, and some hemlock.

Profile of Buchanan very stony loam in a gently sloping, wooded area 2 miles north of Aristes:

O2—2 inches to 0, black (N 2/0) organic material derived principally from oak leaves; strongly acid (pH 5.2); abrupt, smooth boundary; 2 to 3 inches thick.

A1—0 to 5 inches, brown (7.5YR 4/4) loam; 20 to 30 percent of horizon is coarse fragments; weak, medium, subangular blocky structure breaking to moderate, fine, granular structure; friable when moist; plentiful roots; strongly acid (pH 5.2); clear, wavy boundary; 4 to 6 inches thick.

B21—5 to 10 inches, brown (7.5YR 5/4), gritty sandy loam; 20 to 30 percent of horizon is coarse fragments and stones; moderate, fine, subangular blocky structure; friable when moist, slightly sticky when wet; plentiful roots; strongly acid (pH 5.4); clear wavy boundary; 4 to 6 inches thick.

B22—10 to 19 inches, light-brown (7.5YR 4/6) sandy loam; 30 to 40 percent of horizon is coarse fragments; moderate, fine and medium, subangular blocky structure; thin, discontinuous clay films on ped surfaces; firm when moist, slightly sticky when wet; few roots; strongly acid (pH 5.4); clear, wavy boundary; 8 to 10 inches thick.

B23—19 to 32 inches, brown (7.5YR 5/4) sandy clay loam; 30 to 40 percent of horizon is coarse fragments and stones; many, fine, faint, pink (7.5YR 7/4) mottles; moderate, medium, subangular blocky structure; firm when moist, sticky when wet; few roots to a depth of 22 inches; strongly acid (pH 5.4); gradual, wavy boundary; 12 to 15 inches thick.

Bx—32 to 38 inches, strong-brown (7.5YR 5/8) clay loam containing many quartz crystals and stones; 30 to 40 percent of horizon is coarse fragments; many, medium, distinct mottles of pink (7.5YR 7/4), light brown (7.5YR 6/4), and light gray (N 7/0); moderate, coarse, prismatic structure breaking to weak, medium, platy structure; very firm when moist, sticky when wet; strongly acid (pH 5.4); 5 to 7 inches thick.

C—38 to 42 inches, strong-brown (7.5YR 5/8) sandy loam containing many quartz crystals; as much as 80 percent of horizon is sandstone cobbles; few, medium, distinct mottles of light gray (N 7/8); weak, thin, platy structure; firm when moist; strongly acid (pH 5.2).

The surface layer is cobbly loam and very stony loam. The hue centers on 10YR, but a hue of 7.5YR is common. Texture varies widely in the lower horizons. Most of the stones have been removed from the surface in a few small areas that are used for improved pasture. Depth to the pan ranges from about 20 to 36 inches. Depth to bedrock ranges from slightly more than 3 feet to about 20 feet. In very deep soils, the lower C horizon is very gritty and is mottled in only a few places.

CALVIN SERIES

The Calvin series consists of shallow to moderately deep, well-drained soils that formed in material weathered from calcareous red shale on gently sloping to steep hillsides. These soils are just north of the terraces along the North Branch of the Susquehanna River. They are Sols Bruns Acides. Calvin soils occur with the deep, well-drained Belmont soils. Calvin soils are of about the same depth and have about the same base status as Klinesville soils. In contrast to the acid red shale and sandstone of the Klinesville soils, Calvin soils formed in material weathered from calcareous red shale. The forest cover was mixed hardwoods, but most areas of Calvin soils have been cleared and are used for crops.

Profile of Calvin shaly silt loam, neutral substratum, in moderately sloping cropland 1.5 miles north of Lime Ridge:

Ap—0 to 8 inches, dark reddish-brown (2.5YR 3/4) shaly silt loam; 30 to 40 percent of horizon is coarse fragments; weak, fine, granular structure; friable when moist; plentiful roots; medium acid (pH 5.9); abrupt, smooth boundary; 7 to 8 inches thick.

B—8 to 13 inches, weak-red (10R 4/3) very shaly silt loam; 60 to 70 percent of horizon is coarse fragments; weak, fine, subangular blocky structure; friable when moist, slightly sticky when wet; few roots; medium acid (ph 6.0); clear, wavy boundary; 4 to 6 inches thick.

C—13 to 20 inches, weak-red (10R 4/3) silt loam deposited on and between fragments of soft, shattered red shale; about 90 percent of horizon is coarse fragments; slightly acid (pH 6.3); gradual, wavy boundary; 5 to 10 inches thick.

R—20 inches +, calcareous red shale.

A hue of 2.5YR or 10R is most common in these soils. A few clay films occur in patches in the B horizon. Depth to unconsolidated material ranges from about 10 to 20 inches. The unconsolidated material is 2 to 6 inches thick over hard shale. Reaction ranges from medium acid to neutral. A thin mantle of windblown silt overlies this soil in a few places.

CANFIELD SERIES

The Canfield series consists of deep, moderately well drained and somewhat poorly drained soils formed from Wisconsin glacial till that was derived from gray sandstone, shale, and various erratics. These soils occur on gently sloping and moderately sloping uplands in the northeastern corner of the county. They are Grey-Brown Podzolic soils. Canfield soils are the moderately well drained and somewhat poorly drained members of the catena that includes the shallow to moderately deep, well drained Lordstown soils, the deep, well drained Wooster soils, and the poorly drained and somewhat poorly drained Ravenna soils. Associated with this catena are the very poorly drained Lickdale soils. Canfield soils are similar to Watson soils but normally contain a larger amount of coarse fragments of sandstone. The forest cover was mostly mixed hardwoods and some hemlock, but most nonstony areas have been cleared and are used for pasture and crops.

Profile of Canfield channery silt loam in moderately sloping cropland 5 miles east of Benton:

Ap—0 to 8 inches, dark-brown (10YR 4/3) channery silt loam; 10 to 20 percent of horizon is coarse fragments; weak, fine, granular structure; friable when moist, slightly sticky when wet; few roots; medium acid (pH 5.7); abrupt, smooth boundary; 7 to 9 inches thick.

B21—8 to 18 inches, yellowish-brown (10YR 5/4) channery silty clay loam; 10 to 20 percent of horizon is coarse fragments; moderate, fine, subangular blocky structure; thin, discontinuous clay films on ped surfaces; friable when moist, slightly sticky when wet; few roots; medium acid (pH 5.9); clear, wavy boundary; 9 to 11 inches thick.

B22—18 to 27 inches, yellowish-brown (10YR 5/4) channery loam; many, fine, distinct mottles of strong brown (7.5YR 5/6) and very pale brown (10YR 7/4); 10 to 20 percent of horizon is coarse fragments; moderate, medium, subangular blocky structure; thin, discontinuous clay films on ped surfaces; friable when disturbed, but firm in place when moist; few roots to a depth of 21 inches; medium acid (pH 5.7); clear, wavy boundary; 8 to 10 inches thick.

Bx—27 to 33 inches, brown (7.5YR 5/4), gritty channery loam; common, fine, faint mottles of strong brown (7.5YR 5/6); 30 to 40 percent of horizon is coarse fragments; very coarse prismatic structure, structureless inside prisms; friable when disturbed, but firm to very firm in place when moist; strongly acid (pH 5.3); gradual, wavy boundary; 5 to 8 inches thick.

C—33 to 50 inches, reddish-brown (2.5YR 4/4) channery sandy loam; 40 to 50 percent of horizon is coarse fragments; structureless (massive breaking to single grain); friable when disturbed, but firm in place when moist; medium acid (pH 5.6).

The B horizon ranges from channery silty clay loam to loam. Depth to mottling ranges from about 16 to 24 inches, and depth to bedrock is more than 4 feet in most places. Clay films are common in the B horizon. In stony areas the Ap horizon of the profile described is replaced by a similar A1 horizon that contains more organic matter and is overlain by 1 or 2 inches of partly decomposed leaves.

CHENANGO SERIES

The Chenango series consists of deep, well-drained soils formed from glacial outwash of gravel and sand that was mostly derived from acid sandstone and shale (fig. 8). These soils occur on nearly level to strongly sloping terraces, principally along the Susquehanna River. They are Sols Bruns Acides. Chenango soils occur with the moderately well drained and somewhat poorly drained Braceville soils and the very poorly drained to somewhat poorly drained Atherton soils. Chenango soils are similar to Pekin soils but are coarser textured and more stratified. The forest cover was mixed hardwoods, but areas of these soils have been cleared and are used for crops.

Figure 8.—Exposed bank of Chenango silt loam.

Profile of Chenango gravelly sandy loam in a nearly level idle area that was formerly cropland 3 miles east of Bloomsburg (Laboratory No. S59Pa.-19-16-(1-4) in tables 10 and 11):

Ap—0 to 10 inches, very dark grayish-brown (10YR 3/2) gravelly sandy loam; about 50 percent of horizon is coarse fragments; weak, fine, granular structure; friable when moist; has been limed; slightly acid (pH 6.2); many roots; abrupt, smooth lower boundary; 9 to 11 inches thick.

B2—10 to 16 inches, yellowish-brown (10YR 5/6) gravelly coarse sandy loam; about 50 percent of horizon is coarse fragments; weak, medium, subangular blocky structure that tends to be platy; many, thin, discontinuous clay films; friable when moist, slightly sticky when wet; slightly acid (pH 6.2); many roots; clear, wavy lower boundary; 5 to 8 inches thick.

B3—16 to 21 inches, yellowish-brown (10YR 5/4) very gravelly loam; about 80 percent of horizon is coarse fragments; weak, fine, granular structure; few, very thin clay films on ped faces; friable when moist, sticky when wet; slightly acid (pH 6.4); many roots; clear, wavy lower boundary; 4 to 6 inches thick.

C—21 to 48 inches +, yellowish-brown (10YR 5/4) very gravelly coarse loam; about 90 percent of horizon is coarse fragments; no general orientation of fragments; loose, slightly acid (pH 6.4); few roots to 34 inches; coarse fragments are pebbles and few cobbles.

The surface layer is silt loam, gravelly sandy loam, or gravelly loam. The subsoil ranges from gravelly fine sandy loam to gravelly sandy loam. Depth to the C horizon ranges from about 20 inches to several feet. Depth to bedrock is more than 30 feet in most places. The coarse fragments are almost entirely fine pebbles, but there are a few cobbles as much as 6 inches in diameter. In some places the percentage of coarse fragments is much higher than that in the profile described.

DEKALB SERIES

The Dekalb series consists of shallow to deep, well-drained soils formed in material that was derived principally from acid gray sandstone. This material has been worked by the processes of freezing and thawing. These soils are mainly on steep, stony mountainsides and moderately sloping mountaintops. Dekalb soils are Sols Bruns Acides. They commonly occur with Laidig and Buchanan soils and lie above them on the mountainsides. Dekalb soils are similar to Lordstown soils but are coarser textured. Most areas are in trees, mainly red oak, white oak, sassafras, and hickory.

Profile of Dekalb very stony loam in strongly sloping woodland 4 miles southeast of Mill Grove:

O2—2 inches to 0, very dark gray (10YR 3/1), partly decomposed leaf litter and large blocks of sandstone as much as 6 feet along the longest axis; blocks of sandstone make up about 40 percent of horizon; leaf mat has thin platelike structure; abundant fine roots and mycelia; very strongly acid (pH 4.8); abrupt, wavy boundary; 2 to 3 inches thick.

A2—0 to 9 inches, brownish-yellow (10YR 6/6) very stony loam; about 40 percent of horizon is coarse fragments including large blocks of sandstone; weak, fine, granular structure; very friable when moist; few roots; strongly acid (pH 5.3); clear, wavy boundary; 7 to 10 inches thick.

B2—9 to 30 inches, yellowish-brown (10YR 5/4) sandy loam and coarse fragments including large blocks of sandstone; about 50 percent of horizon is coarse fragments; weak, medium, subangular blocky structure; very friable when moist; few roots to about 20 inches; strongly acid (pH 5.3); gradual, irregular boundary; 18 to 23 inches thick.

C1—30 to 36 inches, yellowish-brown (10YR 5/4) sandy loam and coarse fragments, including large blocks of sandstones; about 60 percent of horizon is coarse fragments; structureless (single grain); friable when moist; strongly acid (pH 5.3); gradual, irregular boundary; more than 5 inches thick.

R—36 inches +, gray sandstone bedrock.

The surface layer is very stony loam and channery loam. Depth to bedrock normally is less than 3 feet, but it is greater in some places, especially on benches and lower slopes where additional soil has accumulated. In cultivated areas there is an Ap horizon of channery loam instead of the O2 horizon and the very stony loam A2 horizon of forested soils. The hue of the profile is dominantly 10YR, but a hue of 7.5YR is common.

DUNCANNON SERIES

The Duncannon series consists of deep, well-drained soils that formed from windblown material on gently sloping and moderately sloping uplands. These soils are in a band that extends in an east-west direction north of the Susquehanna River, principally near Bloomsburg. They are Gray-Brown Podzolic soils. Duncannon soils occur with the moderately well drained Lawrenceville soils. The forest cover was mixed hardwoods, but the areas of these soils have been cleared and are used for crops.

Profile of Duncannon silt loam in moderately sloping cropland 2 miles east of Bloomsburg:

Ap—0 to 10 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, fine, granular structure; very friable when moist; abundant roots; has been limed; neutral (pH 7.2); abrupt, smooth boundary; 9 or 10 inches thick.

A2—10 to 15 inches, yellowish-brown (10YR 5/4) silt loam; weak, thick, platy structure breaking to weak, fine, granular structure; friable when moist; plentiful roots; neutral (pH 7.2); abrupt, wavy boundary; 4 to 6 inches thick.

B1—15 to 21 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, fine, subangular blocky structure; friable when moist; plentiful roots; neutral (pH 7.1); gradual, wavy boundary; 4 to 8 inches thick.

B21—21 to 26 inches, yellowish-brown (10YR 5/4) loam; weak, fine, subangular blocky structure; thin, discontinuous clay films on ped surfaces; friable when moist, slightly sticky and slightly plastic when wet; neutral (pH 6.9); clear, wavy boundary; 3 to 7 inches thick.

B22—26 to 34 inches, yellowish-brown (10YR 5/4) silt loam; weak, fine, subangular blocky structure; thin, discontinuous clay films on ped surfaces; friable to firm when moist, nonsticky and nonplastic when wet; few roots; slightly acid (pH 6.5); clear, wavy boundary; 7 to 9 inches thick.

B23—34 to 40 inches, yellowish-brown (10YR 5/4) silt loam containing a few shale chips; weak, fine, subangular blocky structure; friable to firm when moist, slightly sticky and nonplastic when wet; few roots; slightly acid (pH 6.2); clear, wavy boundary; 5 to 7 inches thick.

IIB3—40 to 44 inches, brown (7.5YR 5/4) shaly silt loam; about 30 percent of horizon is red shale chips; weak, fine, subangular blocky structure; friable when moist; few roots; slightly acid (pH 6.4); gradual, wavy boundary; 3 to 6 inches thick.

IIC—44 inches +, brown (7.5YR 5/4) films on upper surfaces of shattered, calcareous, red shale.

The subsoil ranges from silt loam to fine sandy loam. The texture of the substratum varies widely because material was deposited in different strata. Depth to the substratum ranges from 18 inches to about 6 feet. In areas where depth to the substratum is less than 3 feet, some coarse fragments may occur throughout the profile. Hues are 10YR and 7.5YR throughout the solum.

EDGEMONT SERIES

The Edgemont series consists of deep, well-drained soils formed in material that was weathered from sandstone, quartzite, and conglomerates. This material was worked by the process of freezing and thawing. Edgemont soils are in gently sloping and strongly sloping areas of the mountains in the southern part of the county near Centralia. They are Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils. Edgemont soils occur with the Laidig and Buchanan soils, which are at the base of the mountains. Edgemont soils are deeper and normally grittier than the Dekalb soils and contain more small coarse fragments and fewer large blocks of sandstone. Mixed oaks were predominant in the forest, but cutting and extensive burning have left little other than scrub oak and laurel.

Profile of Edgemont very stony loam in gently sloping woodland one-fourth mile north of Aristes:

O2—2 inches to 0, very dark gray (10YR 3/1) organic matter mixed with fine sand; no observable structure; few roots; very strongly acid (pH 4.8); abrupt, smooth boundary; 1 to 2 inches thick.

A1—0 to 12 inches, yellow (10YR 7/8) very stony loam; about 30 percent of horizon is coarse fragments; weak, fine and medium, granular structure; friable when moist, slightly sticky when wet; few roots; strongly acid (pH 5.1); clear, wavy boundary; 11 to 13 inches thick.

B21—12 to 19 inches, yellow (10YR 7/6) loam and coarse fragments, including stones; about 70 percent of

horizon is coarse fragments; weak, medium, subangular blocky structure; friable when moist, nonsticky when wet; no roots; very strongly acid (pH 4.9); clear, wavy boundary; 6 to 8 inches thick.

B22—19 to 27 inches, yellow (10YR 7/6) sandy loam and coarse fragments, including stones; about 70 percent of horizon is coarse fragments; moderate, medium, granular structure; friable when moist, slightly sticky when wet; very strongly acid (pH 4.9); clear, wavy boundary; 7 to 8 inches thick.

B23—27 to 38 inches, reddish-yellow (7.5YR 6/6) sandy clay loam and coarse fragments; about 70 percent of horizon is coarse fragments; moderate, medium, subangular blocky structure; thin, continuous clay films on ped surfaces; firm when moist, sticky when wet; very strongly acid (pH 5.0); gradual, irregular boundary; more than 10 inches thick.

R—38 inches +, sandstone bedrock.

In many places where these soils have been burned over, there is a thin black layer consisting mostly of burned charcoal instead of the O2 horizon described. The subsoil ranges from loam to clay loam that is very stony and contains a high percentage of gravel in all areas. In a few areas these soils are not gritty, but they are generally slightly finer textured than the soil described. Also, they have stronger structure and firmer consistence.

HARTLETON SERIES

The Hartleton series consists of moderately deep, well-drained soils formed from pre-Wisconsin glacial till that was derived from acid, yellow and brown shale, sandstone, and siltstone. These soils occur in areas that range from nearly level till plains to strongly sloping hillsides. They occur throughout the county except in the extreme northern and southern parts. Hartleton soils are Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils. They are in the catena that includes the shallow, well drained Weikert soils, the deep, well drained Allenwood soils, the moderately well drained Watson soils, the somewhat poorly drained Alvira soils, and the poorly drained Shelmadine soils. Associated with this catena are the very poorly drained Lickdale soils. Hartleton soils are not so red as the Leck Kill soils, which formed from weathered red shale. They are similar to the Berks soils in most characteristics, but they have a lower content of coarse fragments and a textural B horizon. The forest cover is mostly oak, but there are a few other hardwoods. Most nonstony areas have been cleared and are used for crops.

Profile of Hartleton channery silt loam in moderately sloping to strongly sloping cropland in Greenwood Township 2 miles northwest of Rohrsburg (Laboratory No. S59Pa.-19-4-(1-6) in tables 10 and 11):

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) channery silt loam; 25 to 30 percent of horizon is coarse fragments; weak, fine, granular structure; friable when moist; abundant roots; has been limed; slightly acid (pH 6.5); abrupt, smooth boundary; 7 to 9 inches thick.

B1—8 to 12 inches, yellowish-brown (10YR 5/4) channery silt loam; about 30 percent of horizon is coarse fragments; weak, fine, subangular blocky structure; friable when moist; few roots; neutral (pH 6.8); clear, wavy boundary; 3 to 5 inches thick.

B21—12 to 20 inches, yellowish-brown (10YR 5/6) channery silt loam; about 30 percent of horizon is coarse fragments; moderate, fine, subangular blocky structure; thin, discontinuous clay films on ped surfaces; friable when moist, slightly sticky when wet; few roots; neutral (pH 6.6); gradual, wavy boundary; 6 to 10 inches thick.

B22—20 to 28 inches, yellowish-brown (10YR 5/6) channery silt loam; about 30 percent of horizon is coarse fragments; moderate, medium, subangular blocky structure; thin, discontinuous clay films on ped surfaces; friable when moist, slightly sticky when wet; few roots; medium acid (pH 5.6); gradual, wavy boundary; 6 to 10 inches thick.

B3—28 to 34 inches, yellowish-brown (10YR 5/6) channery silt loam; 25 to 35 percent of horizon is coarse fragments; weak, medium, subangular blocky structure; thin, discontinuous clay films and black coatings on stones and ped surfaces; friable when moist, nonsticky when wet; no roots; strongly acid (pH 5.4); clear, wavy boundary; 4 to 8 inches thick.

C—34 to 40 inches, yellowish-brown (10YR 5/6) very channery loam; 70 to 80 percent of horizon is coarse fragments; structureless (massive); thin, discontinuous clay films and black coatings on stones; very strongly acid (pH 4.9); clear, wavy boundary; 5 to 7 inches thick.

R—40 inches +, laminated shale, sandstone, or graywacke.

The surface layer is channery silt loam or very stony silt loam. Channery silt loam is the dominant texture throughout the profile, but silty clay loam occurs in the B horizon where these soils grade toward Allenwood soils. In a few places the lower subsoil is much redder than that of the soil described. Depth to the C horizon ranges from about 30 to 40 inches in most places. In stony areas there is a dark grayish-brown A1 horizon instead of an Ap horizon. The A1 horizon is overlain by a thin layer of leaf litter.

Profile of Hartleton channery silt loam in gently sloping cropland in Main Township 2 miles southeast of Bloomsburg (Laboratory No. S59Pa.-19-14-(1-5) in tables 10 and 11):

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) channery silt loam; about 45 percent of horizon is coarse fragments; weak, medium, granular structure; friable when moist; has been limed; slightly acid (pH 6.3); many roots; abrupt, wavy lower boundary; 8 to 10 inches thick.

B1—9 to 13 inches, yellowish-brown (10YR 5/4) channery silty clay loam; about 40 percent of horizon is coarse fragments; weak, fine, subangular blocky structure; thin clay films; friable when moist, sticky and plastic when wet; slightly acid (pH 6.3); clear, wavy lower boundary; 3 to 5 inches thick.

B21—13 to 20 inches, yellowish-brown (10YR 5/4) channery silty clay loam; about 30 percent of horizon is coarse fragments; weak, fine, blocky structure; thin to prominent clay films; friable when moist, sticky and plastic when wet; slightly acid (pH 6.4); abrupt, wavy lower boundary; 5 to 9 inches thick.

B22—20 to 26 inches, yellowish-brown (10YR 5/4) channery silty clay loam; about 40 percent of horizon is coarse fragments; distinct clay films; weak, medium, subangular blocky structure; coarse fragments; friable when moist, sticky when first wet; medium acid (pH 5.9); clear, wavy lower boundary; 4 to 8 inches thick.

B3—26 to 31 inches, strong-brown (7.5YR 5/6) very channery silty clay loam in cracks in the coarse material; about 60 percent of horizon is coarse fragments; blocky structure modified by rocks; clay films and manganese coatings on stones; very firm in place when moist; strongly acid (pH 5.0); dominant color of rock is olive (5Y 5/3).

R—31 inches +, interbedded shale and sandstone.

HOLLY SERIES

The Holly series consists of deep, poorly drained and somewhat poorly drained soils that formed in recent al-

luvium on nearly level flood plains along most of the small streams in the county. These soils are in the Low-Humic Gley great soil group. They occur with the deep, well drained Barbour and Tioga soils, the moderately well drained and somewhat poorly drained Basher and Middlebury soils, and the very poorly drained Papakating soils. Holly soils are redder in areas where they occur with the Barbour and Basher soils than they are in areas where they occur with the Tioga and Middlebury soils. Holly soils are nearer the streams than are the Atherton soils and have less sand in the solum. The forest cover was mostly willow, hemlock, and elm, but most areas have been cleared and are now in pasture or crops.

Profile of Holly silt loam in nearly level cropland 2 miles south of Stillwater:

Ap—0 to 10 inches, dark reddish-gray (5YR 4/2) silt loam containing few coarse fragments; rust streaks along root channels; moderate, coarse, granular structure; friable when moist; plentiful roots to 3 inches; has been limed; slightly acid (pH 6.2); abrupt, smooth boundary; 9 to 10 inches thick.

C1—10 to 22 inches, dark-red (2.5YR 3/6) silty clay loam containing few coarse fragments; many, fine, faint mottles of red (2.5YR 5/6); structureless (massive); friable when moist, sticky and plastic when wet; strongly acid (pH 5.2); clear, wavy boundary; 11 to 13 inches thick.

C2g—22 to 30 inches, dark-gray (10YR 4/1) silty clay containing few coarse fragments; many, medium, prominent mottles of light gray (N 7/0) and red (2.5YR 5/6); structureless (massive); firm when moist, sticky and slightly plastic when wet; very strongly acid (pH 5.0); clear, wavy boundary; 6 to 9 inches thick.

IIC3g—30 to 40 inches +, dark-gray (10YR 4/1) silty clay mixed with gravel that makes up about 90 percent of the horizon; many, medium, prominent mottles of light gray (N 7/0) and red (2.5YR 5/6); structureless (single grain); loose when moist; very strongly acid (pH 5.0); more than 10 inches thick.

Because of differences in stratification and in parent material, the subsoil varies widely in texture. Holly soils are not nearly so red where they occur with the Tioga and Middlebury soils as they are where they occur with Barbour and Basher soils, or in the profile described. Depth to sandy or gravelly material normally ranges from 24 to 40 inches.

KLINESVILLE SERIES

The Klinesville series consists of shallow, well-drained soils that formed from acid red shale and sandstone on ridges and hillsides. These soils occur in most of the county, except in the extreme northern and southern parts. They are Sols Bruns Acides intergrading toward Lithosols. Klinesville soils are the shallow, well drained members of the drainage sequence that includes the moderately deep, well drained Leck Kill soils and the moderately well drained and somewhat poorly drained Albrights soils. Associated with this catena are the poorly drained and somewhat poorly drained Shelmadine soils and the very poorly drained Lickdale soils. Klinesville soils are similar to the Weikert soils, which formed from brown and dark-gray shale and gray sandstone. They are similar to the Oquaga soils in color but have a higher proportion of coarse fragments that are somewhat softer and more easily weathered than those in the Oquaga soils. The native trees were red oak, white oak, maple, beech, and birch. Except for the stony areas, most areas of these soils have been cleared and are used for crops.

Profile of Klinesville shaly silt loam in moderately sloping cropland 3 miles south of Numidia:

Ap—0 to 10 inches, dusky-red (2.5YR 3/2) shaly silt loam; 40 to 50 percent of horizon is coarse fragments; weak, fine, subangular blocky structure; friable when moist; abundant roots; strongly acid (pH 5.3); clear, wavy boundary; 9 to 10 inches thick.

C—10 to 14 inches, weak-red (10R 5/4) very channery silt loam; about 95 percent of horizon is coarse fragments; fragments are dark reddish gray (10R 4/1) inside; structureless; loose when moist; no roots; strongly acid (pH 5.3); more than 4 inches thick.

R—14 inches +, coarsely fractured sandstone and shale.

The surface layer is shaly silt loam or very stony silt loam. In stony areas an A1 horizon occurs that is similar to the Ap horizon described and is overlain by a thin layer of organic material. In some areas where the surface layer is shaly silt loam, the C horizon is absent and the R horizon is platy red shale. Most of the shale breaks down so rapidly that areas now classed as shaly silt loam will be silt loam after a few years of cultivation. In woodland and in alfalfa fields, many roots penetrate deep into the substratum through cracks between the stones.

LACKAWANNA SERIES

The Lackawanna series consists of deep, well-drained soils formed from Wisconsin glacial till that was derived from acid red shale, sandstone, and various erratics. These soils occur on gently sloping to steep uplands in the northeastern part of the county. They are Sols Bruns Acides. Lackawanna soils are the deep, well drained members of the catena that includes the shallow to moderately deep, well drained Oquaga soils, the moderately well drained Wellsboro soils, and the poorly drained and somewhat poorly drained Morris soils. Associated with this catena are the very poorly drained Lickdale soils. Lackawanna soils are not so weathered as the Allenwood soils and normally are coarser textured and contain granite gravel. They have a weak, poorly expressed pan. Much of the area of these soils is still forest of mixed hardwood, but most of the nonstony areas have been cleared and are used for crops.

Profile of Lackawanna channery loam in gently sloping to moderately sloping cropland in Jackson Township 1½ miles northwest of Divide (Laboratory No. S59Pa-19-8-(1-9) in tables 10 and 11):

Ap—0 to 8 inches, reddish-brown (5YR 4/3) channery loam; 20 to 30 percent of horizon is coarse fragments; weak, medium, granular structure; friable when moist; abundant roots; has been limed; neutral (pH 7.1); abrupt, smooth boundary; 7 to 9 inches thick.

A2—8 to 12 inches, reddish-brown (5YR 5/4) channery loam; 20 to 30 percent of horizon is coarse fragments; weak, fine, granular structure; friable when moist; plentiful roots; neutral (pH 6.6); clear, wavy boundary; 3 to 6 inches thick.

B1—12 to 17 inches, reddish-brown (2.5YR 4/4) channery loam; 20 to 30 percent of horizon is coarse fragments; weak, fine, subangular blocky structure; thin, discontinuous clay films on ped surfaces; friable when moist, slightly sticky and slightly plastic when wet; plentiful roots; strongly acid (pH 5.1); gradual, wavy boundary; 3 to 7 inches thick.

B21—17 to 24 inches, reddish-brown (2.5YR 4/4) channery loam; 20 to 30 percent of horizon is coarse frag-

ments; weak, medium, subangular blocky structure; thin, discontinuous clay films on ped surfaces; friable when moist, slightly sticky and slightly plastic when wet; few roots; strongly acid (pH 5.2); gradual, wavy boundary; 5 to 9 inches thick.

B22—24 to 32 inches, weak-red (10R 4/4) channery loam; 20 to 30 percent of horizon is coarse fragments; moderate, medium, subangular blocky structure; thin, discontinuous clay films on ped surfaces; firm when moist, slightly sticky and slightly plastic when wet; few roots; very strongly acid (pH 5.0); gradual, wavy boundary; 6 to 10 inches thick.

B23—32 to 38 inches, weak-red (10R 4/3) channery loam; 20 to 30 percent of horizon is coarse fragments; weak, medium, subangular blocky structure; thin, discontinuous clay films on ped surfaces; firm when moist, slightly sticky and slightly plastic when wet; no roots; very strongly acid (pH 5.0); gradual, wavy boundary; 4 to 8 inches thick.

B31—38 to 45 inches, weak-red (10R 4/4) channery loam; 20 to 30 percent of horizon is coarse fragments; weak, medium, subangular blocky structure; thin, discontinuous clay films on ped surfaces; firm when moist, slightly sticky and nonplastic when wet; very strongly acid (pH 5.0); clear, wavy boundary; 5 to 9 inches thick.

B32—45 to 50 inches, weak-red (10R 4/4) channery loam; 30 to 40 percent of horizon is coarse fragments; weak, medium, subangular blocky structure; thin, discontinuous clay films on ped surfaces; friable when moist, slightly sticky when wet; very strongly acid (pH 5.0); 4 to 6 inches thick.

C—50 to 54 inches +, weak-red (10R 4/3) channery loam; 50 to 60 percent of horizon is coarse fragments; weak, fine, subangular blocky structure; friable when moist, slightly sticky when wet; very strongly acid (pH 5.0); more than 4 inches thick.

The surface layer is very stony loam or channery loam. The subsoil ranges from loam to fine sandy loam. Throughout the profile, hue ranges from 5YR to 10R. Depth to the C horizon ranges from about 40 to 60 inches. In wooded areas the Ap and the A2 horizons of the profile described are replaced by an A1 horizon that is similar to the Ap horizon. This A1 horizon is overlain by a thin, gray layer of organic material. Most of these wooded areas have many large blocks of sandstone on the surface and throughout the profile.

Profile of Lackawanna channery loam in gently sloping to moderately sloping cropland in Sugarloaf Township 1½ miles east of Coles Creek (Laboratory No. S59Pa.-19-9-(1-8) in tables 10 and 11):

Ap—0 to 6 inches, loam that is slightly redder than dark brown (7.5YR 3/2) and coarse fragments make up about 10 percent of horizon; weak, fine, granular structure; friable when moist; has been limed; slightly acid (pH 6.2); few roots; abrupt, smooth lower boundary; 5 to 7 inches thick.

A2—6 to 10 inches, reddish-brown (2.5YR 4/4) loam; about 20 percent of horizon is coarse fragments; weak, fine, granular structure; thin films of clay around peds; friable when moist, nonsticky when wet; medium acid (pH 5.8); very few roots; clear, wavy lower boundary; 3 to 5 inches thick.

B1—10 to 16 inches, weak-red (10R 4/3) channery fine sandy loam; about 30 percent of horizon is coarse fragments; weak, fine, subangular blocky structure; thin, discontinuous clay films; friable when moist, slightly sticky and slightly plastic when wet; strongly acid (pH 5.2); very few roots; clear, wavy lower boundary; 5 to 8 inches thick.

B21—16 to 22 inches, weak-red (10R 4/3) channery loam; about 30 percent of horizon is coarse fragments; weak, medium, subangular blocky structure that tends to be platy; thin, discontinuous clay films on peds; firm in place when moist, nonsticky and nonplastic when wet; very strongly acid (pH 5.0); gradual, wavy lower boundary; 4 to 8 inches thick.

B22 22 to 32 inches, weak-red (10R 4/3) channery loam; about 30 percent of horizon is coarse fragments; few, fine, distinct mottles of red (10R 4/8) and reddish gray (10R 6/1); mottles are discontinuous; weak to moderate, medium, subangular blocky structure that tends to be platy; thin, common, discontinuous clay films on peds; firm in place when moist, slightly sticky and slightly plastic when wet; very strongly acid (pH 5.0); gradual, wavy lower boundary; 8 to 13 inches thick.

B23—32 to 44 inches, dusky-red (10R 3/4) channery loam; about 40 percent of horizon is coarse fragments; weak, medium, subangular blocky structure that tends to be platy; common, thin, discontinuous clay films; very fine particles of sand and silt; friable or firm in place when moist, slightly sticky when wet; very strongly acid (pH 4.9); abrupt, wavy lower boundary; 9 to 13 inches thick.

Bx—44 to 51 inches, dusky-red (10R 3/2 to 3/3) gravelly and channery loam; about 60 percent of horizon is coarse fragments; weak, thick, platy structure breaking to weak, fine, subangular blocky structure; very few, thin clay films; very fine particles of silt and sand; firm when moist, nonsticky and nonplastic when wet; very strongly acid (pH 4.9); gradual, wavy lower boundary; 6 to 10 inches thick.

C—51 inches +, dusky-red (10R 3/2 to 3/3) very channery fine sandy loam; about 80 percent of horizon is coarse fragments; massive with a tendency to platiness; very few, very thin clay films; friable when moist, nonsticky and nonplastic when wet; very strongly acid (pH 4.8); coarse fragments are cobbles and boulders of olive-gray graywacke.

LAIDIG SERIES

The Laidig series consists of deep, well-drained soils that formed in mixed colluvium. These soils are in gently sloping and moderately sloping areas at the base of the steep slopes of most mountains in Columbia County. They are Red-Yellow Podzolic soils. They occur with the moderately well drained and somewhat poorly drained Buchanan soils. Laidig soils formed in mixed colluvium at the base of slopes, and Chenango soils formed in stratified material on glacial terraces. Laidig soils contain many more large stones and cobbles than Chenango soils and are finer textured in the B horizon. Most areas of Laidig soils are wooded, but a few areas have been cleared and are used for crops or pasture. The forest cover consists mainly of oak, maple, hickory, and sassafras.

Profile of Laidig very stony loam in strongly sloping woodland 4 miles north of Martzville:

O1—1 inch to 0, newly fallen leaves about 1 inch thick.

A1—0 to 3 inches, gray (N 5/0) very stony loam high in organic-matter content; no recognizable structure; very friable when moist; abundant roots; strongly acid (pH 5.2); clear, wavy boundary; 2 to 3 inches thick.

A2—3 to 12 inches, strong-brown (7.5YR 5/6) loam; 20 to 30 percent of horizon is coarse fragments; weak, fine, granular structure; very friable when moist; plentiful roots; strongly acid (pH 5.3); gradual, wavy boundary; 8 to 11 inches thick.

B1—12 to 19 inches, strong-brown (7.5 YR 5/8) heavy silt loam; 30 to 40 percent of horizon is coarse fragments; weak, fine, subangular blocky structure; friable when moist, slightly sticky when wet; plentiful roots; strongly acid (pH 5.3); clear, wavy boundary; 6 to 8 inches thick.

B21—19 to 29 inches, strong-brown (7.5YR 5/6) silty clay loam; 30 to 40 percent of horizon is coarse fragments; moderate, medium, subangular blocky struc-

ture; thin, discontinuous clay films on ped surfaces; slightly firm when moist, slightly sticky when wet; plentiful roots; strongly acid (pH 5.2); clear, wavy boundary; 9 to 11 inches thick.

B22—29 to 41 inches, strong-brown (7.5YR 5/6) sandy clay loam; 60 to 70 percent of horizon is coarse fragments; moderate, fine to medium, subangular blocky structure; firm when moist, slightly sticky when wet; few roots, strongly acid (pH 5.3); gradual, irregular boundary; 9 to 14 inches thick.

C—41 to 45 inches, yellowish-red (5YR 4/8) sand in cracks between stones, which make up about 90 percent of the horizon; structureless; nonsticky when wet; no roots; strongly acid (pH 5.3); more than 4 inches thick.

The surface layer is gravelly loam or very stony loam. The subsoil varies in texture. A fragipan occurs in some places, normally at a depth below 3 feet. The hue throughout the profile ranges from 10YR to 5YR but normally is 7.5YR or 10YR. Depth to the C horizon normally is more than 3 feet, and depth to bedrock ranges from 4 to 20 feet. In cultivated areas the A1 and A2 horizons are replaced by a reddish-yellow to strong-brown Ap horizon.

LAWRENCEVILLE SERIES

The Lawrenceville series consists of deep, moderately well drained soils that formed in fine, windblown material on nearly level to moderately sloping uplands. These soils extend from east to west in a band north of the Susquehanna River, principally near Bloomsburg. They are Gray-Brown Podzolic soils. Lawrenceville soils have a weakly developed fragipan. These soils occur with the deep, well-drained Duncannon soils. The forest cover was mixed hardwoods, but the areas of these soils have been cleared and are used for crops.

Profile of Lawrenceville silt loam in a gently sloping idle area in Scott Township 1 mile east of Bloomsburg (Laboratory No. S59Pa.-19-11-(1-10) in tables 10 and 11):

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; weak, medium, granular structure; friable when moist; abundant roots; slightly acid (pH 6.2); abrupt, smooth boundary; 8 to 9 inches thick.

A2—8 to 14 inches, yellowish-brown (10YR 5/4) silt loam; weak, medium, granular structure; friable when moist; plentiful roots; slightly acid (pH 6.5); clear, wavy boundary; 5 to 7 inches thick.

B21—14 to 19 inches, yellowish-brown (10YR 5/4) silt loam; weak, fine, subangular blocky structure; thin, discontinuous clay films on ped surfaces; friable when moist; plentiful roots; neutral (pH 6.6); clear, wavy boundary; 4 to 6 inches thick.

B22—19 to 24 inches, dark-brown (7.5YR 4/4) loam; weak, medium, platy structure; thin, discontinuous clay films on ped surfaces; friable when moist; few roots; slightly acid (pH 6.5); clear, wavy boundary; 4 to 6 inches thick.

B23—24 to 30 inches, dark-brown (7.5YR 4/2) loam; common, prominent, black concretions; few, medium, distinct mottles of light brownish gray (10YR 6/2); weak, medium, platy structure; thin, discontinuous clay films on ped surfaces; friable when moist; few roots; neutral (pH 6.3); clear, wavy boundary; 5 to 7 inches thick.

B24—30 to 35 inches, dark-brown (7.5YR 4/2) loam; few, medium, distinct mottles of yellowish brown (10YR 5/6); weak, medium, platy structure; many black and reddish-brown concretions; thick, discontinuous clay films on ped surfaces; friable when moist; no roots; neutral (pH 6.9); abrupt, wavy boundary; 4 to 6 inches thick.

Bx1—35 to 41 inches, strong-brown (7.5YR 5/6) silt loam; common, medium, distinct mottles of yellowish brown (10YR 5/4) and yellowish red (5YR 5/6); weak prismatic structure breaking to weak, medium, platy structure; frosting of fine sand and silt on structural faces; many black concretions; firm when moist, slightly sticky and slightly plastic when wet; slightly acid (pH 6.4); abrupt, wavy boundary; 5 to 7 inches thick.

Bx2—41 to 44 inches, strong-brown (7.5YR 5/6) silt loam; many, coarse, distinct mottles of reddish brown (5YR 4/4) and yellowish red (5YR 5/6); weak prismatic structure breaking to weak, thick, platy structure; frosting of fine sand and silt on structural faces; thin, continuous clay films and manganese coatings on ped surfaces; firm when moist, slightly sticky and plastic when wet; strongly acid pH 5.4); abrupt, wavy boundary; 2 to 4 inches thick.

Bx3—44 to 55 inches, yellowish-red (5YR 5/6) silt loam; many, coarse, distinct mottles of red (2.5YR 4/6); moderate, medium, platy structure that shows some stratification; thick, continuous clay films on ped surfaces; firm when moist, slightly sticky and plastic when wet; medium acid (pH 5.8); abrupt, wavy boundary; 9 to 13 inches thick.

C—55 to 64 inches, yellowish-brown (10YR 5/6) very fine sandy loam; weak, medium, platy structure that shows some stratification; very friable when moist; strongly acid (pH 5.4); more than 8 inches thick.

The subsoil ranges from silt loam to fine sandy loam. It is normally platy, but in some places it is blocky. In many places the C horizon is red silty clay that has blocky structure. Gravel commonly occurs below 3 feet. Depth to the C horizon ranges from about 36 to 72 inches. In many places the peds appear to be coated with silt instead of clay.

Profile of Lawrenceville silt loam, in a gently sloping pasture in Montour Township 1 mile west of Bloomsburg (Laboratory No. S59Pa.-19-12-(1-11) in tables 10 and 11):

Ap—0 to 9 inches, dark-brown (10YR 3/3) silt loam; weak, medium, granular structure; friable when moist; abundant roots; has been limed; neutral (pH 6.6); abrupt, smooth boundary; 8½ to 9½ inches thick.

A2—9 to 12 inches, dark-brown (10YR 4/3) silt loam; weak, fine, granular structure; friable when moist; plentiful roots; slightly acid (pH 6.4); clear, wavy boundary; 2 to 4 inches thick.

B1—12 to 17 inches, yellowish-brown (10YR 5/6) silt loam; weak prismatic structure breaking to weak, fine, subangular blocky structure; thick, vesicular coatings of silt on peds; few, fine, blocky concretions; friable when moist; slightly acid (pH 6.4); clear, wavy boundary; 4 to 7 inches thick.

B21—17 to 25 inches, yellowish-brown (10YR 5/4) silt loam; weak, medium prismatic structure breaking to weak, medium, subangular blocky structure; few, very thin clay films on peds; common, fine, blocky concretions; slightly firm in place when moist, slightly plastic when wet; slightly acid (pH 6.4); abrupt, wavy boundary; 7 to 9 inches thick.

B22—25 to 32 inches, dark yellowish-brown (10YR 4/4) silt loam; common, medium and coarse, distinct mottles and streaks of light brownish gray (10YR 6/2) and strong brown (7.5YR 5/6); weak, medium, subangular blocky structure and weak, medium, platy structure; common, fine, black concretions; very thin, discontinuous films of clay and frosting of silt and fine sand on peds; firm in place when moist, slightly sticky and slightly plastic when wet; strongly acid (pH 5.2); abrupt, wavy boundary; 6 to 8 inches thick.

Bx1—32 to 36 inches, yellowish-brown (10YR 5/4) loam; common, medium, distinct mottles of light brownish gray (10YR 6/2) and strong brown (7.5YR 5/6); weak, medium, prismatic structure breaking to weak, medium, platy structure; common, fine, black concretions; very thick, discontinuous films of clay and frosting of silt and very fine sand on peds; firm in place, slightly firm when moist if displaced, sticky and nonplastic when wet; strongly acid (pH 5.1); clear, wavy boundary; 3 to 6 inches thick.

Bx2—36 to 41 inches, yellowish-brown (10YR 5/6) very fine sandy loam; few, fine, faint mottles of light brownish gray (10YR 6/2); weak, medium, prismatic structure breaking to weak, medium, platy structure; fine black concretions; little clay bridging on peds; firm in place when moist; strongly acid (pH 5.2); abrupt, wavy boundary; 4 to 6 inches thick.

Bx3—41 to 46 inches, dark yellowish-brown (10YR 4/4) very fine sandy loam; common, medium, distinct mottles of light brownish gray (10YR 6/2) and grayish brown (10YR 5/2); weak, medium, prismatic structure breaking to weak, medium, platy structure; common, fine, black concretions; little clay bridging on peds; firm in place when moist; vesicular; strongly acid (pH 5.2); abrupt, wavy boundary; 4 to 6 inches thick.

B31—46 to 57 inches, reddish-brown (5YR 4/4) light very fine sandy loam, common, medium, prominent mottles of light brownish gray (10YR 6/2) and strong brown (7.5YR 5/6); weak, coarse, prismatic structure breaking to weak platy structure; common, fine, black concretions; few films in the pores; firm when moist; very strongly acid (pH 5.0); gradual, wavy boundary; 10 to 15 inches thick.

B32—57 to 66 inches, reddish-brown (2.5YR 4/4) silt loam; common, coarse and medium, prominent mottles of strong brown (7.5YR 5/6) and pinkish gray (7.5YR 6/2); weak, medium or thick, platy structure; some stratification; very fine black concretions; thick, discontinuous clay films on peds; slightly firm when moist, sticky when wet; strongly acid (pH 5.0); abrupt, wavy boundary; 8 to 10 inches thick.

B33—66 to 72 inches, red (2.5YR 4/6) silt loam; common, coarse and medium, prominent mottles of strong brown (7.5YR 5/6) and yellowish red (5YR 4/6); moderate, thin to medium, platy structure breaking to weak, fine, blocky structure; numerous black concretions; thin, continuous clay films on peds; firm in place, slightly firm when moist, sticky and plastic when wet; very strongly acid (pH 5.0).

LECK KILL SERIES

The Leck Kill series consists of moderately deep and deep, well-drained soils that formed from glaciated, acid red shale and sandstone on nearly level to strongly sloping uplands. Deep areas of these soils are on hills, till plains, and mountainsides. Leck Kill soils are in most parts of the county except the extreme northern and southern. These soils are Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils. They are the moderately deep, well drained members of the drainage sequence that includes the shallow, well drained Klinesville soils and the moderately well drained and somewhat poorly drained Albrights soils. Associated with this catena are the somewhat poorly drained and poorly drained Shelmadine soils and the very poorly drained Lickdale soils. The deep Leck Kill soils are similar to the Belmont soils, which formed from calcareous red shale but have a higher base status than Leck Kill soils. The deep Leck Kill soils are also similar to the Lackawanna soils but show stronger weathering and normally are finer textured and have more accumulated clay in the B horizon. Leck Kill soils are similar to the Oquaga soils but are normally deeper and show more weathering. The forest cover on the Leck Kill soils was mixed hardwoods, but most areas have been cleared and are used for crops.

Profile of Leck Kill channery silt loam in gently sloping to moderately sloping, moderately eroded cropland in Franklin Township 3 miles southwest of Catawissa (Laboratory No. S59Pa.–19–13–(1–5) in tables 10 and 11):

Ap—0 to 8 inches, dark-brown (7.5YR 4/2) channery silt loam; about 15 percent of horizon is coarse fragments; weak, fine, granular structure; friable when moist; has been limed; slightly acid (pH 6.2); abrupt, smooth boundary; 7 to 9 inches thick.

B21—8 to 15 inches, dark reddish-gray (5YR 4/2) gritty loam; about 15 percent of horizon is coarse fragments; moderate, medium and fine, subangular blocky structure; thin, distinct clay films on the peds; friable when moist, sticky when wet; neutral (pH 6.6); clear, wavy boundary; 5 to 9 inches thick.

B22—15 to 24 inches, reddish-brown (5YR 4/3) channery loam; about 20 percent of horizon is coarse fragments; moderate, medium, prismatic structure breaking to moderate, medium, blocky structure; distinct clay films; friable when moist, sticky and plastic when wet; neutral (pH 6.8); clear, wavy boundary; 7 to 11 inches thick.

B3—24 to 29 inches, reddish-brown (5YR 4/3) channery silt loam; about 35 percent of horizon is coarse fragments; moderate, medium and fine, blocky structure; discontinuous clay films and common black coatings on the peds; firm in place when moist, sticky and plastic when wet; neutral (pH 6.8); abrupt, irregular boundary; 4 to 10 inches thick.

C—29 to 37 inches, reddish-brown (2.5YR 4/4) channery silty clay loam; about 45 percent of horizon is coarse fragments; blocky structure modified by coarse fragments; clay films and common black coatings on peds; firm in place when moist, sticky when wet; neutral (pH 6.7).

R—37 inches +, weak-red (2.5YR 4/2) rock material of fine-grained sandstone and some shale; similar to the C horizon but contains less fine material.

Profile of Leck Kill channery silt loam in gently sloping to moderately sloping cropland in Main Township 1 mile east of Mainville (Laboratory No. S59Pa–19–15–(1–5) in tables 10 and 11):

Ap—0 to 10 inches, dark-brown (7.5YR 4/2) channery silt loam; 15 to 25 percent of horizon is coarse fragments; weak, medium, granular structure; friable when moist; abundant roots; has been limed; neutral (pH 6.8); abrupt, wavy boundary; 9 to 11 inches thick.

B1—10 to 14 inches, weak-red (2.5YR 4/2) channery silt loam; 15 to 25 percent of horizon is coarse fragments; weak, fine, subangular blocky structure; thin, discontinuous clay films on ped surfaces; friable when moist; few roots; neutral (pH 7.2); clear, wavy boundary; 3 to 5 inches thick.

B21—14 to 23 inches, reddish-brown (2.5YR 4/4) channery silt loam; 20 to 30 percent of horizon is coarse fragments; moderate, medium, subangular blocky structure; thin, continuous clay films on ped surfaces; friable when moist, slightly sticky and slighty plastic when wet; few roots; neutral (pH 7.3); clear, wavy boundary; 7 to 11 inches thick.

B22—23 to 27 inches, reddish-brown (2.5YR 4/4) channery silt loam; 30 to 40 percent of horizon is coarse fragments; moderate, medium, blocky structure; thin, discontinuous clay films on ped surfaces; friable when moist, slightly sticky and slightly plastic when wet; few roots; neutral (pH 7.2); clear, wavy boundary; 3 to 6 inches thick.

B3—27 to 32 inches, reddish-brown (2.5YR 4/4) very channery clay loam; 60 to 70 percent of horizon is coarse fragments; weak, medium, platy structure; thin, discontinuous clay films and manganese coatings on ped surfaces; friable when moist, slightly sticky and slightly plastic when wet; no roots; medium acid (pH 5.9); gradual, wavy boundary; 3 to 7 inches thick.

R—32 inches +, mixed red shale, siltstone, and sandstone that is dusky red (10R 3/4), reddish brown (2.5YR 4/4), and dark brown (7.5YR 4/2).

The surface layer is channery silt loam or very stony silt loam. The subsoil ranges from silt loam to silty clay loam. Depth to the C horizon, or to the R horizon where no C is present, ranges from about 20 to 32 inches. The C horizon is clay loam in many places. In some places depth to bedrock ranges from 4 to 6 feet.

Profile of Leck Kill channery silt loam, deep, in strongly sloping woodland 3 miles east of Mainville:

O2—2 inches to 0, dark-gray (5YR 4/1), silty organic matter; abrupt, smooth boundary; 1 to 2 inches thick.

A1—0 to 4 inches, light reddish-brown (2.5YR 6/4) channery silt loam; 15 to 20 percent of horizon is coarse fragments; weak, fine, granular structure; friable when moist; plentiful roots; strongly acid (pH 5.2); abrupt, smooth boundary; 4 to 5 inches thick.

A2—4 to 8 inches, pale-red (10R 6/3) channery silt loam; 15 to 20 percent of horizon is coarse fragments; moderate, medium, granular structure; friable when moist; plentiful roots; strongly acid (pH 5.2); clear, wavy boundary; 3 to 5 inches thick.

B21—8 to 13 inches, reddish-brown (2.5YR 5/4) channery silty clay loam; 15 to 20 percent of horizon is coarse fragments; moderate, fine, subangular blocky structure; thin, continuous clay films on ped surfaces; firm when moist, slightly sticky when wet; plentiful roots; strongly acid (pH 5.2); clear, wavy boundary; 4 to 6 inches thick.

B22—13 to 25 inches, red (2.5YR 4/6) channery silty clay loam; 20 to 30 percent of horizon is coarse fragments; moderate, fine, subangular blocky structure; thin, continuous clay films on ped surfaces; firm when moist, slightly sticky when wet; plentiful roots; strongly acid (pH 5.2); clear, wavy boundary; 11 to 13 inches thick.

B23—25 to 33 inches, red (2.5YR 4/6) channery silty clay loam; 30 to 40 percent of horizon is coarse fragments; moderate, fine to medium, subangular blocky structure; thick, discontinuous clay films on ped surfaces; firm when moist, sticky and slightly plastic when wet; few roots; strongly acid (pH 5.2); clear, wavy boundary; 7 to 9 inches thick.

B24—33 to 38 inches, red (2.5YR 4/6) channery silty clay loam; 20 to 30 percent of horizon is coarse fragments; weak, fine, subangular blocky structure; some black coatings on stone fragments; firm when moist, sticky when wet; few roots; strongly acid (pH 5.2); clear, wavy boundary; 4 to 6 inches thick.

B25—38 to 46 inches, reddish-brown (5YR 5/4) channery silty clay loam; 30 to 40 percent of horizon is coarse fragments; weak, fine, subangular blocky structure; firm when moist, slightly sticky when wet; few roots; strongly acid (pH 5.2); clear, wavy boundary; 7 to 9 inches thick.

C—46 inches +, small amount of reddish-brown silt loam in cracks in sandstone and partly weathered red shale.

In cultivated areas the A1 and A2 horizons are replaced by a dark-brown Ap horizon. The B horizon generally is silty clay loam, but near the base of sandstone mountains it is sandier. In some places the structure of the lower B horizon is weak and platy. Depth to bedrock ranges from 4 to 6 feet or more.

LICKDALE SERIES

The Lickdale series consists of deep, very poorly drained soils that formed in deep glacial till consisting of shale, sandstone, and siltstone. These soils are in nearly level areas in depressions and at the head of drainageways. They are principally in the northern part of the county in Sugarloaf Township, but small areas are scattered throughout most of the county. Lickdale soils are Humic Gley soils. They are the very poorly drained members of upland catenas of acid soils but are more poorly drained and finer textured than other members. Lickdale soils have a more strongly developed profile and are less plastic than Papakating soils. Most areas are in forest of hemlock and birch.

Profile of Lickdale silt loam in nearly level woodland 2 miles southeast of Central:

A1—0 to 2 inches, black (N 2/0) mucky silt loam containing very few coarse fragments; weak, fine, granular structure, nonsticky when wet; few roots; very strongly acid (pH 4.8); clear, smooth boundary; 2 to 3 inches thick.

A2g—2 to 7 inches, very dark grayish-brown (10YR 3/2) silt loam containing very few coarse fragments; many, very fine, distinct mottles of reddish brown (5YR 5/4); weak, fine, subangular blocky structure; slightly sticky when wet; few roots; very strongly acid (pH 4.8); clear, wavy boundary; 4 to 6 inches thick.

B21g—7 to 18 inches, gray (10YR 6/1) silty clay loam containing few coarse fragments; many, fine, prominent mottles of reddish yellow (7.5YR 6/8); weak, medium, subangular blocky structure; sticky and slightly plastic when wet; few roots; strongly acid (pH 5.2); gradual, irregular boundary; 9 to 14 inches thick.

B22—18 to 30 inches, light yellowish-brown (10YR 6/4) channery silty clay; about 30 percent of horizon is coarse fragments; many, fine, faint mottles of yellowish brown (10YR 5/8) and pale brown (10YR 6/3); structureless (massive); sticky and plastic when wet; few roots; strongly acid (pH 5.2); clear, wavy boundary; 10 to 13 inches thick.

B3—30 to 40 inches, brownish-yellow (10YR 6/6) channery heavy silt loam; about 30 percent of horizon is coarse fragments; many, fine, distinct mottles of strong brown (7.5YR 5/8); structureless (massive); sticky and slightly plastic when wet; few roots; strongly acid (pH 5.2); more than 10 inches thick.

R—40 inches +, partly weathered, acid gray shale and sandstone.

The surface layer is silt loam or very stony silt loam. In some places large blocks of sandstone and conglomerate are found on the surface and througout the profile. The A1 horizon extends to a depth of 8 inches in some places and has many yellow streaks. A hue of 10YR dominates, but a hue of 2.5Y is common.

LITZ SERIES

The Litz series consists of shallow to moderately deep, well-drained soils that formed from dark-gray calcareous shale on gently sloping to strongly sloping uplands. These soils are principally in the Jerseytown area. They are Red-Yellow Podzolic soils intergrading toward Lithosols. Litz soils occur with the deep, well drained Westmoreland soils and the moderately well drained Wiltshire soils. Litz soils are similar to the Weikert soils in depth but are not so strongly acid. They are more shallow than the Berks soils and are more nearly neutral in the subsoil, and there is enough lime in the

underlying rock to react with acid. The forest cover is mixed hardwoods, but most areas have been cleared and used for crops.

Profile of Litz silt loam in gently sloping woodland 1¼ miles west of Jerseytown:

A1—0 to 2 inches, dark grayish-brown (10YR 4/2) silt loam containing few coarse fragments; weak, fine, granular structure; friable when moist; plentiful roots; medium acid (pH 5.6); clear, wavy boundary; 2 to 3 inches thick.

A2—2 to 5 inches, yellowish-brown (10YR 5/4) silt loam containing few coarse fragments; weak, fine, granular structure; friable when moist; plentiful roots; medium acid (pH 5.6); clear, wavy boundary; 2 to 4 inches thick.

B1—5 to 7 inches, yellowish-brown (10YR 5/4) heavy silt loam; 5 to 15 percent of horizon is coarse fragments; weak, fine, subangular blocky structure; friable when moist, slightly sticky when wet; plentiful roots; strongly acid (pH 5.5); gradual, wavy boundary; 1 to 4 inches thick.

B2—7 to 10 inches, strong-brown (7.5YR 5/8) shaly silty clay loam; 20 to 30 percent of horizon is coarse fragments; strong, medium, subangular blocky structure; thick, discontinuous clay films on ped surfaces; firm when moist, sticky when wet; few roots; strongly acid (pH 5.5); gradual, wavy boundary; 2 to 5 inches thick.

B3—10 to 15 inches, brown (7.5YR 5/4) gritty, very shaly silt loam; 50 to 60 percent of horizon is coarse fragments; moderate, fine, blocky structure; thick, discontinuous clay films on stones and ped surfaces; firm when moist, nonsticky when wet; few roots; medium acid (pH 5.8); gradual, irregular boundary; 3 to 8 inches thick.

C—15 to 25 inches, brown (7.5YR 5/4) very shaly silt loam; 70 to 80 percent of horizon is coarse fragments; gritty; structureless (single grain); loose when moist; no roots; slightly acid (pH 6.2).

R—25 inches +, dark-colored shale.

The percentage of coarse fragments, hardness of shale, and the pH increase with depth. Depth to hard shale ranges from about 20 to 30 inches. The surface layer is silt loam or shaly silt loam. The underlying shale normally has been leached of free carbonates to a depth of several feet or more.

LORDSTOWN SERIES

The Lordstown series consists of moderately deep to shallow, well-drained soils formed from Wisconsin glacial till that was derived from acid gray sandstone, shale, and various erratics. These soils occur on till plains and mountainsides in the northern part of the county. They are Sols Bruns Acides. Lordstown soils are the moderately deep to shallow members of the drainage sequence that includes the deep, well drained Wooster soils, the moderately well drained and somewhat poorly drained Canfield soils, and the poorly drained and somewhat poorly drained Ravenna soils. The very poorly drained Lickdale soils are associated with this catena. Lordstown soils are similar to Weikert soils but are deeper to hard rock. Most areas are in mixed hardwoods, but some nonstony areas have been cleared and are used for crops and pasture.

Profile of Lordstown channery silt loam in moderately sloping idle land 2 miles east of Benton:

O2—1 inch to 0, partly decomposed leaves.

A1—0 to 5 inches, very dark brown (10YR 2/2) channery silt loam; 10 to 20 percent of horizon is coarse fragments; high organic-matter content; weak, very fine, granular structure; very friable when moist; plentiful roots; very strongly acid (pH 4.8); abrupt, smooth boundary; 4 to 5 inches thick.

A2—5 to 9 inches, yellowish-brown (10YR 5/4) channery silt loam; 10 to 20 percent of horizon is coarse fragments; weak, fine, granular structure; very friable when moist, slightly sticky when wet; plentiful roots; very strongly acid (pH 4.6); clear, wavy boundary; 3 to 5 inches thick.

B21—9 to 14 inches, brown (10YR 4/3) channery silt loam; 10 to 20 percent of horizon is coarse fragments; weak, thin, platy structure breaking to weak, fine, granular structure; very friable when moist, slightly sticky and slightly plastic when wet; plentiful roots; extremely acid (pH 4.4); clear, wavy boundary; 4 to 6 inches thick.

B22—14 to 22 inches, dark yellowish-brown (10YR 4/4) very channery silt loam; 50 to 60 percent of horizon is coarse fragments; weak, fine, granular structure; friable when moist, slightly sticky and slightly plastic when wet; plentiful roots; very strongly acid (pH 4.6); clear, wavy boundary; 7 to 9 inches thick.

B3—22 to 25 inches, yellowish-brown (10YR 5/4) very channery silt loam; 50 to 60 percent of horizon is coarse fragments; weak, thin, platy structure breaking to weak, fine, granular structure; friable when moist, slightly sticky and plastic when wet; plentiful roots; very strongly acid (pH 4.5); abrupt, wavy boundary; 2 to 3 inches thick.

R—25 inches +, shale that has pale-brown (10YR 6/3) clay films on upper surface.

The surface layer is channery silt loam or very stony silt loam. The A1 horizon of the profile described appears to be a very old Ap horizon; it is similar to the Ap horizon in cultivated areas. In stony areas, which have not been cleared, the boundary of the A1 horizon is not so smooth and abrupt as that described. Depth to bedrock ranges from 1 to 3 feet. Where depth to bedrock is more than 2 feet, a horizon of weathered shale and sandstone overlies the hard rock. A micropodzol occurs in some places.

MIDDLEBURY SERIES

The Middlebury series consists of deep, moderately well drained and somewhat poorly drained Alluvial soils that formed in recent deposits of silt, clay, and fine sand on nearly level and gently sloping flood plains. These soils are principally along Little Fishing Creek and the Susquehanna River. They are the moderately well drained to somewhat poorly drained members of the catena that includes the deep, well drained Tioga soils, the poorly drained and somewhat poorly drained Holly soils, and the very poorly drained Papakating soils. Middlebury soils are similar to the Basher soils but are not so red and normally contain less gravel. The forest cover is mostly mixed hardwoods, but there are a few pine and hemlock. Most areas have been cleared, however, and are used for crops.

Profile of Middlebury silt loam in nearly level cropland 5 miles west of Numidia:

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) silt loam containing few coarse fragments; weak, medium, granular structure; friable when moist; plentiful roots; has been limed; medium acid (pH 6.0); abrupt, smooth boundary; 9 to 10 inches thick.

AC—9 to 18 inches, dark-brown (10YR 3/3) silt loam containing few coarse fragments; weak, medium, platy structure; friable when moist, slightly sticky when wet; few roots; medium acid (pH 5.6); clear, wavy boundary; 8 to 10 inches thick.

C1—18 to 26 inches, dark-brown (7.5YR 4/4) silt loam containing few coarse fragments; common, fine, distinct mottles of pinkish gray (5YR 6/2); moderate, medium, platy structure; firm when moist, slightly sticky when wet; few roots; strongly acid (pH 5.4); clear, wavy boundary; 7 to 9 inches thick.

C2—26 to 30 inches, reddish-brown (5YR 4/3) silty clay loam containing few coarse fragments; many, medium, distinct mottles of dark red (2.5YR 3/6); moderate, medium, platy structure; firm when moist, sticky when wet; no roots; medium acid (pH 5.6); abrupt, wavy boundary; 3 to 5 inches thick.

C3—30 to 36 inches, brown (7.5YR 5/4) gravelly sandy loam; 20 to 30 percent of horizon is fine gravel; moderate, medium, subangular blocky structure; firm when moist; strongly acid (pH 5.4); 5 to 6 inches thick.

IIC—36 inches +, stratified sand and gravel.

The surface layer is fine sandy loam and silt loam. Because of differences in parent material and some stratification, there is a wide range in color and texture throughout the profile. Some coal dust occurs in the Middlebury soils along the Susquehanna River, and in these places the soils are normally darker and more acid than those along smaller streams.

MORRIS SERIES

The Morris series consists of deep, poorly drained and somewhat poorly drained soils that formed from deep glacial till of Wisconsin age. The till consisted mainly of red shale, siltstone, sandstone, graywacke, and various erratics. These soils are in the northern part of the county in nearly level and gently sloping areas near the base of slopes and on hillside benches. They are Sols Bruns Acides intergrading toward Low-Humic Gley soils. Morris soils are the poorly drained and somewhat poorly drained members of the catena that includes the shallow to moderately deep, well drained Oquaga soils, the well drained Lackawanna soils, and the moderately well drained and somewhat poorly drained Wellsboro soils. Associated with this catena are the very poorly drained Lickdale soils. Morris soils are similar to Ravenna soils, which formed at similar locations in till consisting of gray sandstone, yellow shale, and graywacke. The Morris soils are redder and normally finer textured than the Ravenna soils. The forest cover is mostly hemlock, but many cleared areas are overgrown with goldenrod, poverty grass, and witch hazel.

Profile of Morris channery silt loam in a nearly level idle area 1 mile southeast of Central:

A1—0 to 5 inches, dark-gray (10YR 4/1) channery silt loam; 15 to 20 percent of horizon is coarse fragments; weak, fine, granular structure; friable when moist; many roots; strongly acid (pH 5.3); clear, smooth boundary; 4 to 5 inches thick.

B21g—5 to 9 inches, light-gray (10YR 7/1) channery silty clay loam; 15 to 20 percent of horizon is coarse fragments; many, coarse, distinct mottles of brownish yellow (10YR 6/6); moderate, medium to coarse, subangular blocky structure; thin, discontinuous clay films on ped surfaces; firm when moist, slightly sticky when wet; very few roots; medium acid (pH 5.7); clear, wavy boundary; 3 to 5 inches thick.

B22—9 to 13 inches, dark yellowish-brown (10YR 4/4) silty clay loam; about 20 percent of horizon is coarse fragments; many, coarse, prominent mottles of gray (5YR 6/1); moderate, medium, subangular blocky structure; thin, discontinuous clay films on ped surfaces; firm when moist, slightly sticky and slightly plastic when wet; no roots; very strongly acid (pH 4.6); clear, wavy boundary; 3 to 5 inches thick.

B23g—13 to 18 inches, light-gray (10YR 7/2) channery clay loam; about 30 percent of horizon is coarse fragments; many, coarse, prominent mottles of brownish yellow (10YR 6/6) and reddish brown (2.5YR 5/4); moderate, coarse, subangular blocky structure; thin, continuous clay films on ped surfaces; firm when moist, sticky and slightly plastic when wet; very strongly acid (pH 4.8); clear, wavy boundary; 4 to 6 inches thick.

Bx—18 to 38 inches, strong-brown (7.5YR 5/8) channery clay loam; about 30 percent of horizon is coarse fragments; many, coarse, prominent mottles of light gray (10YR 7/1); moderate, coarse, prismatic structure; thick, continuous clay films on ped surfaces; very firm when moist, sticky and plastic when wet; medium acid (pH 5.8); abrupt, smooth boundary; 19 to 21 inches thick.

R—38 inches +, graywacke that is all coarse fragments.

The surface layer is channery silt loam or very stony silt loam. The amount of coarse fragments varies considerably in the upper horizons. The Bx horizon ranges from clay loam to heavy silt loam. Depth to mottling ranges from about 4 to 16 inches, and depth to the R horizon ranges from 3 feet to more than 5 feet. In some places, especially where these soils occur closely with the Lackawanna soils, the hue of the matrix is 7.5YR or 5YR.

OQUAGA SERIES

The Oquaga series consists of shallow to moderately deep, well-drained soils formed from Wisconsin glacial till that was derived from acid red sandstone, shale, and various erratics on till plains and mountains in the northern part of the county. These soils are Sols Bruns Acides intergrading toward Lithosols. Oquaga soils are the shallow to moderately deep, well drained members of the catena that includes the deep, well drained Lackawanna soils, the moderately well drained and somewhat poorly drained Wellsboro soils, and the poorly drained and somewhat poorly drained Morris soils. Associated with this catena are the very poorly drained Lickdale soils. The Oquaga soils are similar to the Leck Kill soils, which formed from similar parent material that is of pre-Wisconsin age instead of Wisconsin age. The Oquaga soils, however, are not so deep as the Leck Kill soils, and they lack accumulated clay in the B horizon. Oquaga soils are similar to the Klinesville soils in color but are normally somewhat deeper to hard rock, are somewhat coarser textured, and contain a smaller proportion of coarse fragments. Most areas are in oak, maple, and hemlock, but some nonstony areas have been cleared and are used for crops and pasture.

Profile of Oquaga very stony silt loam in strongly sloping woodland 1 mile south of Central:

O1—2 inches to 1 inch, dark-brown leaf litter.

O2—1 inch to 0, very dark grayish-brown (10YR 3/2) organic mat containing many fine rootlets and mycelia; very strongly acid (pH 4.6); abrupt, smooth boundary; 1 to 2 inches thick.

A—0 to 7 inches, reddish-brown (5YR 4/4) very stony silt loam; 40 to 50 percent of horizon is coarse fragments; weak, fine, granular structure; friable when moist, slightly sticky when wet; plentiful roots; strongly acid (pH 5.1); clear, wavy boundary; 6 to 8 inches thick.

B—7 to 19 inches, yellowish-red (5YR 4/6) silt loam and coarse fragments; coarse fragments make up 40 to 50 percent of horizon; weak, fine, subangular blocky structure; friable when moist, slightly sticky when

wet; plentiful roots; strongly acid (pH 5.1); clear, wavy boundary; 11 to 13 inches thick.

C—19 to 22 inches, reddish-brown (5YR 5/4) silt loam and coarse fragments; coarse fragments make up 80 to 90 percent of horizon; structureless; loose when moist; very strongly acid (pH 4.9); abrupt, irregular boundary; 1 to 6 inches thick.

R—22 inches +, interbedded red shale and sandstone.

The surface layer is channery silt loam or very stony silt loam. The soil material in the B horizon ranges from silt loam to loam. The C horizon is at a depth of 10 to 20 inches and is 0 to 12 inches thick. In cultivated areas where erosion has been severe, the Ap horizon includes part or all of the B horizon. Hue centers on 5YR but may be 2.5YR or 7.5YR. Coarse fragments are generally flaggy sandstone blocks, but there is some hard red shale.

PAPAKATING SERIES

The Papakating series consists of deep, very poorly drained Humic Gley soils that formed from silt, clay, and fine sand on nearly level flood plains. These soils are mainly in scattered areas along small meandering streams. They are the very poory drained members of the catena that includes the deep, well drained Tioga soils, the moderately well drained and somewhat poorly drained Middlebury soils, and the poorly drained and somewhat poorly drained Holly soils. Papakating soils are similar to Shelmadine soils but contain more organic matter and are darker colored. The vegetation in most areas is swamp grass and cattails.

Profile of Papakating silty clay loam in an area of nearly level idle land 3 miles east of Light Street:

A1g—0 to 10 inches, dark grayish-brown (10YR 4/2) silty clay loam; many, fine, prominent mottles of strong brown (7.5YR 5/8) along root channels; weak, thin, platy structure breaking to moderate, fine, granular structure; nonsticky when wet; plentiful roots; very strongly acid (pH 5.0); gradual, wavy boundary; 8 to 12 inches thick.

Cg—10 to 28 inches, gray (10YR 5/1) silty clay loam; many, fine, distinct mottles of yellowish brown (10YR 5/4) and strong brown (7.5YR 5/6); weak, thin, platy structure; sticky and slightly plastic when wet; no roots; very strongly acid (pH 4.6); gradual, wavy boundary; 16 to 20 inches thick.

IICg—28 to 40 inches +, very dark gray (10YR 3/1) mucky silty clay loam; common, fine, distinct mottles of yellowish brown (10YR 5/4); structureless; sticky when wet; very strongly acid (pH 4.6); more than 12 inches thick.

In many places the surface layer is more mucky than that described. The substratum is sandy clay loam in some places. In some areas there is a considerable amount of gravel throughout the profile.

PEKIN SERIES

The Pekin series consists of deep, moderately well drained and somewhat poorly drained soils that formed from mixed material on high, nearly level stream terraces. These soils are principally along Huntington Creek. The Pekin soils in Columbia County are more cobbly than is normal for the series. They are Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils. Pekin soils are generally above the Barbour and Basher soils on flood plains. They are similar to Braceville soils but are finer textured and less stratified and have less lime in the substratum. The forest cover was mixed hardwoods and hemlock, but the area in Pekin soils has been cleared and is used for crops.

Profile of Pekin silt loam, cobbly variant, in nearly level cropland 1 mile east of Forks:

Ap—0 to 8 inches, dark-brown (7.5YR 3/2) silt loam; 5 to 10 percent of horizon is fine gravel; weak, fine, granular structure; friable when moist, slightly sticky when wet; plentiful roots; slightly acid (pH 6.4); abrupt, wavy boundary; 7 to 9 inches thick.

A2—8 to 17 inches, brown (7.5YR 4/4) silt loam; 10 to 20 percent of horizon is coarse gravel; weak, fine, granular structure; friable when moist, slightly sticky when wet; few roots; medium acid (pH 5.8); gradual, wavy boundary; 7 to 12 inches thick.

B21—17 to 22 inches, strong-brown (7.5YR 5/6) cobbly silty clay loam; 30 to 40 percent of horizon is gravel and cobbles as much as 8 inches in diameter; many, medium, distinct mottles of gray (10YR 6/1); moderate, medium, subangular blocky structure; thin, discontinuous clay films on ped surfaces; firm when moist, sticky when wet; few roots to 20 inches; strongly acid (pH 5.4); gradual, irregular boundary; 3 to 8 inches thick.

B22—22 to 40 inches, brown (7.5YR 5/4) cobbly silty clay loam; 30 to 40 percent is gravel and cobbles as much as 12 inches in diameter; many, coarse, distinct mottles of gray (10YR 6/1); weak, thick, platy structure; thin, discontinuous clay films on ped surfaces; firm when moist, sticky when wet; strongly acid (pH 5.2); diffuse, irregular boundary; 15 to 22 inches thick.

IIC—40 inches +, stratified sand, gravel, and cobbles.

Depth to mottling generally ranges from about 14 to 30 inches, but in small areas mottling appears in the Ap horizon as a result of erosion and mixing with lower horizons. Depth to the C horizon ranges from about 36 to 60 inches, and depth to bedrock ranges from about 6 to 40 feet. In all horizons there is a wide range in the amount of gravel and cobbles. The B22 horizon is massive rather than platy in some places.

RAVENNA SERIES

The Ravenna series consists of deep, poorly drained and somewhat poorly drained soils formed from Wisconsin glacial till that was derived from acid gray sandstone, shale, and various erratics on nearly level to moderately sloping uplands. In this county these soils occur in the northeastern corner. They are Gray-Brown Podzolic soils intergrading toward Low-Humic Gley soils. Ravenna soils are the poorly drained to somewhat poorly drained members of the catena that includes the shallow to moderately deep, well drained Lordstown soils, the deep, well drained Wooster soils, and the moderately well drained and somewhat poorly drained Canfield soils. Associated with this catena are the very poorly drained Lickdale soils. Ravenna soils are similar to Shelmadine soils but are not so fine textured and normally contain more coarse fragments. The forest cover was mostly hemlock, beech, and maple, but much of the area in Ravenna soils has been cleared and is used for pasture and crops.

Profile of Ravenna channery silt loam in a nearly level idle area 1½ miles north of Bendertown:

Ap—0 to 5 inches, very dark grayish-brown (2.5Y 3/2) channery silt loam; 15 to 20 percent of horizon is coarse fragments; moderate, fine to medium, granular structure; very friable when moist; plentiful roots; has been limed; medium acid (pH 6.0); clear, wavy boundary; 4 to 6 inches thick.

A2—5 to 8 inches, light olive-brown (2.5Y 5/4) channery silt loam; 15 to 20 percent of horizon is coarse fragments; common, medium, prominent mottles of strong brown (7.5YR 5/6) and light brownish gray (2.5Y 6/2); weak, thin, platy structure breaking to moderate, fine, granular structure; friable when moist, slightly sticky and slightly plastic when wet; few roots; medium acid (pH 5.6); clear, wavy boundary; 2 to 4 inches thick.

B1g—8 to 10 inches light brownish-gray (2.5Y 6/2) channery light silty clay loam; 15 to 20 percent of horizon is coarse fragments; many, medium, prominent mottles of strong brown (7.5YR 5/8); moderate, medium, platy structure breaking to moderate, very fine, subangular blocky structure; thin, discontinuous clay films on ped surfaces; friable when moist, slightly sticky and plastic when wet; no roots; strongly acid (pH 5.4); abrupt, wavy boundary; 2 to 3 inches thick.

B21g—10 to 17 inches, light brownish-gray (2.5Y 6/2) channery light silty clay loam; 20 to 30 percent of horizon is coarse fragments; many, coarse, prominent mottles of strong brown (7.5YR 5/6); moderate, medium to thick, platy structure breaking to moderate, fine, subangular blocky structure; thick, continuous clay films on ped surfaces; slightly firm when moist, sticky and plastic when wet; strongly acid (pH 5.2); gradual, wavy boundary; 6 to 9 inches thick.

B22g—17 to 29 inches, light brownish-gray (2.5Y 6/2) silty clay loam; 5 to 10 percent of horizon is coarse fragments; many, coarse, prominent mottles of strong brown (2.5YR 5/6); weak, medium, platy structure; thick, continuous clay films on ped surfaces; firm when moist, sticky and plastic when wet; very strongly acid (pH 5.0); clear, wavy boundary; 10 to 14 inches thick.

Bx—29 to 42 inches +, dark grayish-brown (2.5Y 4/2) silt loam; 5 to 10 percent of horizon is coarse fragments; many, medium, prominent mottles of dark brown (7.5YR 4/4) and strong brown (7.5YR 5/6); coarse prisms have weak, medium, platy interior structure; clay films on prism faces; very firm when moist, slightly sticky and plastic when wet; very strongly acid (pH 5.0); more than 12 inches thick.

Depth to mottling ranges from 4 to 12 inches. Mottling is nearer the surface in depressions than on knolls. In wooded areas the Ap horizon is replaced by a similar A1 horizon that is overlain by 2 or 3 inches of decaying organic matter interlaced with many fine roots and mycelia. In these areas the A2 horizon generally is not platy.

SHELMADINE SERIES

The Shelmadine series consists of deep, poorly drained and somewhat poorly drained soils formed from pre-Wisconsin glacial till that was derived from acid sandstone, siltstone, and shale on nearly level and gently sloping uplands. These soils occur throughout most of the county, but not in the most northern and southern parts. They are Low-Humic Gley soils. Shelmadine soils are similar to Ravenna soils but are finer textured and normally contain fewer coarse fragments. The forest cover was mostly hemlock, beech, and maple, but most nonstony areas have been cleared and are used for pasture and crops.

Profile of Shelmadine silt loam in nearly level cropland in Greenwood Township 2 miles southwest of Rohrsburg (Laboratory No. S59Pa.-19-2-(1-8) in tables 10 and 11):

Ap—0 to 8 inches, strong-brown (7.5YR 5/8) silt loam containing few coarse fragments; moderate, medium, granular structure; friable when moist; abundant roots; strongly acid (pH 5.4); abrupt, wavy boundary; 7 to 9 inches thick.

B1—8 to 11 inches, light olive-brown (2.5Y 5/4) silty clay loam containing few coarse fragments; common, medium, distinct mottles of yellowish brown (10YR 5/8), grayish brown (10YR 5/2), and gray (5Y 5/1); weak, medium, subangular blocky structure; thin, discontinuous clay films in pores; friable when moist, slightly sticky and plastic when wet; plentiful roots; strongly acid (pH 5.2); clear, wavy boundary; 2 to 4 inches thick.

B21—11 to 15 inches, light olive-brown (2.5Y 5/4) silty clay containing few coarse fragments; many, coarse, distinct mottles of grayish brown (2.5Y 5/2), brownish yellow (10YR 6/8), and gray (5Y 5/1); moderate, medium, prismatic structure breaking to moderate, medium, blocky structure; thick, continuous clay films on ped surfaces; friable when moist, slightly sticky and plastic when wet; plentiful roots; very strongly acid (pH 5.0); gradual, wavy boundary; 3 to 5 inches thick.

B22—15 to 22 inches, light olive-brown (2.5Y 5/4) silty clay loam containing few coarse fragments; common, medium, distinct mottles of grayish brown (2.5Y 5/2), brownish yellow (10YR 6/6), and gray (5Y 5/1); caps of structural prisms break to moderate, medium, blocky structure; silt and fine sand coatings on prism surfaces; thick, continuous clay films on ped surfaces; friable when moist, slightly sticky and plastic when wet; few roots; very strongly acid (pH 5.0); gradual, wavy boundary; 5 to 9 inches thick.

B23—22 to 32 inches, light olive-brown (2.5Y 5/4) silty clay loam containing few coarse fragments; common, coarse, distinct mottles of gray (5Y 5/1), grayish brown (2.5Y 5/2), and brownish yellow (10YR 6/6); moderate, very coarse, prismatic structure breaking to moderate, medium, blocky structure; thick, continuous clay films on ped surfaces; friable when moist, slightly sticky and plastic when wet; no roots; strongly acid (pH 5.1); gradual, wavy boundary; 8 to 12 inches thick.

Bx1—32 to 36 inches, grayish-brown (2.5Y 5/2) silt loam containing few coarse fragments; common, medium, distinct mottles of gray (5Y 6/1) and brownish yellow (10YR 6/6); moderate, very coarse, prismatic structure breaking to moderate, medium, platy structure; thin, continuous clay films on ped surfaces; very firm when moist, slightly sticky and plastic when wet; very strongly acid (pH 4.9); abrupt, wavy boundary; 3 to 6 inches thick.

Bx2—36 to 42 inches, light-gray (10YR 6/1) silt loam; 5 to 10 percent of horizon is coarse fragments; common, medium, prominent mottles of strong brown (7.5YR 5/6) and grayish brown (2.5Y 5/2); moderate, very coarse, prismatic structure breaking to weak, medium, platy structure; thin, continuous clay films on ped surfaces; firm when moist, sticky and plastic when wet; very strongly acid (pH 5.0); clear, wavy boundary; 5 to 7 inches thick.

C—42 to 50 inches, dark-brown (10YR 4/3) silt loam and coarse fragments; coarse fragments make up 20 to 30 percent of horizon; common, medium, prominent mottles of light gray (N 6/0), yellowish red (5YR 4/8), and strong brown (7.5YR 5/8); weak, thin, platy structure; thin, discontinuous clay films on ped surfaces; friable when moist, slightly sticky and slightly plastic when wet; very strongly acid (pH 5.0); more than 8 inches thick.

The surface layer is silt loam or very stony silt loam. The subsoil ranges from silt loam to silty clay. The lower subsoil ranges from neutral to very strongly acid and, when nearly dry, is very firm. In some places manganese coatings occur in the lower subsoil. Depth to the C horizon ranges from about 28 to 40 inches. In stony areas the Ap horizon is replaced by an A1 horizon that

contains a large amount of organic matter, is dark grayish brown, and has a clear, wavy lower boundary. Where Shelmadine soils occur with the Albrights soils, the entire profile is redder than that described.

Profile of Shelmadine silt loam in nearly level cropland in Greenwood Township three-fourths of a mile southwest of Rohrsburg (Laboratory No. S59Pa-19-6-(1-9) in tables 10 and 11):

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) silt loam and coarse fragments; coarse fragments make up 10 to 15 percent of horizon; weak, medium, platy structure breaking to moderate, medium, granular structure; friable when moist; abundant roots; strongly acid (pH 5.2); abrupt, smooth boundary; 8 to 9 inches thick.

A2g—9 to 11 inches, light brownish-gray (10YR 6/2) gravelly silt loam; 20 to 30 percent of horizon is coarse fragments; many, medium, prominent mottles of brownish yellow (10YR 6/6) and strong brown (7.5YR 5/8); weak, thin and medium, platy structure; many fine pores; friable when moist; plentiful roots; very strongly acid (pH 5.0); clear, irregular boundary; 1 to 5 inches thick.

B1g—11 to 16 inches, light brownish-gray (10YR 6/2) gravelly silt loam; 20 to 30 percent of horizon is coarse fragments; many, medium, prominent mottles of light gray (10YR 6/1) and strong brown (7.5YR 5/8); moderate, medium, blocky structure; discontinuous films of clay and coatings of silt and fine sand on the peds; friable to firm when moist, slightly plastic when wet; few roots; very strongly acid (pH 4.8) clear, wavy boundary; 4 to 6 inches thick.

B21g—16 to 23 inches, light-gray (N 6/0) gravelly silt loam; 20 to 30 percent of horizon is coarse fragments; many, coarse, prominent mottles of strong brown (7.5YR 5/8) and reddish gray (5YR 5/2); weak, coarse, blocky structure breaking to weak, fine, blocky structure; many, discontinuous films of clay and coatings of fine sand on the peds; firm when moist, slightly sticky and slightly plastic when wet; many iron and manganese concretions; a few roots extend to 22 inches; very strongly acid (pH 5.0); gradual, wavy boundary; 5 to 9 inches thick.

B22—23 to 31 inches, reddish-brown (5YR 5/4) light gravelly silt loam; 15 to 20 percent of horizon is coarse fragments; many, medium, prominent mottles of gray (5Y 5/1) and yellowish red (5YR 5/8); weak, blocky structure breaking to weak, thin, platy structure; thick clay films on the peds; firm when moist, slightly sticky when wet; strongly acid (pH 5.2); clear, wavy boundary; 6 to 10 inches thick.

Bx1—31 to 39 inches, strong-brown (7.5YR 5/6) silt loam; 5 to 10 percent of horizon is coarse fragments; common, coarse, distinct mottles of light brownish gray (10YR 6/2) and reddish brown (5YR 5/4); moderate, very coarse, prismatic structure breaking to weak, thin and medium, platy structure; a few clay films and some reddish films on peds; very firm when moist; strongly acid (pH 5.2); abrupt, wavy boundary; 6 to 9 inches thick.

Bx2—39 to 42 inches, black (5YR 2/1) and yellowish-red (5YR 4/6) silt loam; 10 to 15 percent of horizon is coarse fragments; structureless (massive); discontinuous clay films in pores; hard when dry, very firm when moist; many iron and manganese concretions; strongly acid (pH 5.3); abrupt, wavy boundary; 1 to 4 inches thick.

IIC1—42 to 47 inches, dark-brown (7.5YR 4/4) loam having a few streaks of strong brown (7.5YR 5/8) and gray (10YR 6/1); very weak, medium, platy structure; some clay bridging; friable when moist; strongly acid (pH 5.4); gradual, wavy boundary; 4 to 7 inches thick.

IIC2—47 to 58 inches +, dark-brown (10YR 4/3) silt loam having a few faint streaks of dark yellowish brown (10YR 4/4); very weak, medium, platy structure; friable when moist; medium acid (pH 5.7).

TIOGA SERIES

The Tioga series consists of deep, well-drained Alluvial soils that formed from deposits of silt, clay, and fine sand on nearly level flood plains. These soils occur principally along Little Fishng Creek and the Susquehanna River. They are the well drained members of the catena that includes the moderately well drained and somewhat poorly drained Middlebury soils and the poorly drained Papakating soils. Tioga soils are similar to the Barbour soils but are not so red and normally contain less gravel. The forest cover was mostly mixed hardwoods, but most areas have been cleared and are used for crops.

Profile of Tioga silt loam, high bottom, in nearly level woodland 1 mile southwest of Bloomsburg:

O2—1 inch to 0, very dark grayish-brown (10YR 3/2) silty mat of partly decomposed leaves and many fine rootlets; strongly acid (pH 5.2); about 1 inch thick.

A1—0 to 4 inches, olive-brown (2.5Y 4/4) silt loam containing few coarse fragments; weak, very thin, platy structure; very friable when moist; plentiful roots; strongly acid (pH 5.2); clear, wavy boundary; 3 to 5 inches thick.

C1—4 to 10 inches, dark grayish-brown (10YR 4/2) very fine sandy loam containing few coarse fragments; structureless (single grain); loose when moist; plentiful roots; medium acid (pH 5.6); clear, smooth boundary; 4 to 7 inches thick.

C2—10 to 20 inches, dark-brown (10YR 3/3) silt loam containing few coarse fragments and some coal dust; moderate, fine, subangular blocky structure; friable when moist; plentiful roots; extremely acid (pH 4.4); clear, wavy boundary 8 to 13 inches thick.

C3—20 to 23 inches, reddish-brown (5YR 4/4) sandy clay loam containing few coarse fragments; weak, fine, subangular blocky structure; very friable when moist; plentiful roots; strongly acid (pH 5.4); gradual, wavy boundary; 2 to 7 inches thick.

C4—23 inches +, brown (7.5YR 5/4) gravelly silty clay loam; 20 to 30 percent of horizon is fine gravel; moderate, medium, subangular blocky structure; firm when moist; few roots to about 30 inches; strongly acid (pH 5.4); over 5 feet thick.

The surface layer is fine sandy loam, gravelly loam, and silt loam. Small amounts of coal dust are in the Tioga soils along the Susquehanna River, but not along the smaller streams. Tioga soils are less acid where there is no coal dust. Texture and color vary widely because there is some stratification and the parent material varies. The profile described contains more clay than normal, especially in the deepest horizon. In many places this horizon is gravelly sandy loam.

WASHINGTON SERIES

The Washington series consists of deep, well-drained soils that formed from limestone and various impurities on uplands near the north side of the Susquehanna River. These soils are Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils. They are in the drainage sequence that includes the moderately well drained Wiltshire soils. Compared with the Allenwood soils, the Washington soils are finer textured, contain more coarse fragments, are more nearly neutral, and are slightly redder. Also, Washington soils developed from impure limestone instead of acid yellow shale, as did the Allenwood soils. The area of Washington soils was once covered with mixed hardwoods, but all of it has been cleared and is used for crops.

Profile of Washington silt loam 6 miles west of Berwick in a moderately sloping idle area that was formerly cropland:

Ap—0 to 9 inches, dark-brown (7.5YR 3/2) silt loam containing few coarse fragments; weak, fine, granular structure; friable when moist; abundant roots; has been limed; mildly alkaline (pH 7.5) ; abrupt, smooth boundary; 8 to 9 inches thick.

A2—9 to 13 inches, yellowish-red (5YR 4/6) silt loam containing few coarse fragments; weak, fine, granular structure; friable when moist; plentiful roots; neutral (pH 7.2) ; clear, wavy boundary; 3 to 5 inches thick.

B1—13 to 19 inches, yellowish-red (5YR 5/6) clay loam; 5 to 10 percent of horizon is coarse fragments; weak, fine, subangular blocky structure; very friable when moist, sticky when wet; plentiful roots; mildly alkaline (pH 7.4) ; clear, wavy boundary; 5 to 7 inches thick.

B21—19 to 28 inches, red (2.5YR 4/8) gravelly heavy silt loam; 20 to 30 percent of horizon is coarse fragments; moderate, fine, subangular blocky structure; firm when moist, slightly sticky when wet; few roots; mildly alkaline (pH 7.4) ; gradual, wavy boundary; 7 to 10 inches thick.

B22—28 to 37 inches, red (10R 4/6) gravelly clay loam; 40 to 50 percent of horizon is coarse fragments; moderate, fine to medium, subangular blocky structure; many manganese coatings on stones and ped surfaces; firm when moist, sticky when wet; few roots; medium acid (pH 6.0) ; gradual, irregular boundary; 7 to 11 inches thick.

B23—37 to 47 inches, dark-red (10R 3/6) gravelly sandy clay loam; 40 to 50 percent of horizon is coarse fragments; moderate, thick, platy structure; many manganese coatings and thin, discontinuous clay films on stones and ped surfaces; firm when moist, slightly sticky when wet; few roots; medium acid (pH 5.8) ; clear, wavy boundary; 9 to 13 inches thick.

B3—47 to 60 inches, red (2.5YR 4/6) very gravelly clay loam; 70 to 80 percent of horizon is coarse fragments; moderate, fine, subangular blocky structure; slightly firm when moist, sticky when wet; no roots; slightly acid (pH 6.3) ; abrupt, wavy boundary; 13 to 15 inches thick.

C—60 to 70 inches +, red (2.5YR 4/8) very gravelly loam; 70 to 80 percent of horizon is coarse fragments; structureless; friable when moist; slightly acid (pH 6.3).

In some areas the underlying limestone is nearly pure. In these areas hue is redder than 2.5YR in only a few places, reaction below the plow layer is more alkaline than that described, and the C horizon is neutral or mildly alkaline. In some places a thin mantle of silt is on the surface.

WATSON SERIES

The Watson series consists of deep, moderately well drained soils formed from pre-Wisconsin glacial till that was derived from acid gray sandstone, siltstone, and shale on gently sloping and moderately sloping till plains. These soils are principally in the north-central part of the county. They are Red-Yellow Podzolic soils. Watson soils are the moderately well drained members of the catena that includes the shallow, well drained Weikert soils, the moderately deep, well drained Hartleton soils, the deep, well drained Allenwood soils, the somewhat poorly drained Alvira soils, and the poorly drained Shelmadine soils. Associated with this catena are the very poorly drained Lickdale soils. Watson soils are similar to the Canfield soils but normally contain fewer coarse sandstone fragments. The forest cover was mixed hardwoods, but most areas have been cleared and are used for crops.

Profile of a Watson silt loam in gently sloping cropland in Greenwood Township one-half mile southwest of Rohrsburg (Laboratory No. S59Pa–19–7–(1–8) in tables 10 and 11) :

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) silt loam; 10 to 15 percent of horizon is coarse fragments; weak, medium, granular structure; friable when moist; plentiful roots; has been limed; slightly acid (pH 6.3) ; abrupt, wavy boundary; 8 to 9 inches thick.

B1—8 to 13 inches, brown (10YR 5/3) silt loam; 5 to 10 percent of horizon is coarse fragments; weak, fine, subangular blocky structure; friable when moist, slightly sticky and slightly plastic when wet; plentiful roots; slightly acid (pH 6.5) ; clear, wavy boundary; 4 to 6 inches thick.

B21—13 to 18 inches, yellowish-brown (10YR 5/6) silt loam; 10 percent of horizon is coarse fragments; weak, fine, subangular blocky structure; thin, discontinuous clay films on ped surfaces; friable when moist, sticky and plastic when wet; few roots; slightly acid (pH 6.3) ; gradual, wavy boundary; 3 to 7 inches thick.

B22—18 to 24 inches, strong-brown (7.5YR 5/6) shaly silt loam; 25 to 35 percent of horizon is coarse fragments; moderate, medium, subangular blocky structure; thin, discontinuous clay films on ped surfaces; firm when moist, sticky and plastic when wet; few roots; strongly acid (pH 5.5) ; gradual, wavy boundary; 4 to 8 inches thick.

Bx1—24 to 35 inches, yellowish-red (5YR 5/6) shaly loam; 20 to 30 percent of horizon is coarse fragments; common, fine, prominent mottles of light brownish gray (10YR 6/2) and black (N 2/0) ; weak, very coarse, prismatic structure breaking to moderate, medium, blocky structure; thin, discontinuous clay films on ped surfaces; very firm when moist, sticky and plastic when wet; few roots; strongly acid (pH 5.2) ; gradual, wavy boundary; 9 to 13 inches thick.

Bx2—35 to 43 inches, strong-brown (7.5YR 5/6) shaly silt loam; 20 to 30 percent of horizon is coarse fragments; common, medium, prominent mottles of grayish brown (2.5Y 5/2) and black (N 2/0) ; weak, very coarse, prismatic structure breaking to moderate, medium, subangular blocky structure; thick, discontinuous clay films on ped surfaces; very firm when moist, sticky and plastic when wet; no roots; very strongly acid (pH $.0) ; gradual, wavy boundary; 6 to 10 inches thick.

Bx3—43 to 52 inches, yellowish-brown (10YR 5/4) shaly loam; 20 to 30 percent of horizon is coarse fragments; common, fine, faint mottles of light olive brown (2.5Y 5/4) ; very coarse prismatic structure breaking to weak, fine, blocky structure; thin, discontinuous clay films on ped surfaces; very firm when moist, nonsticky and nonplastic when wet; very strongly acid (pH 5.0) ; gradual, wavy boundary; 7 to 11 inches thick.

C—52 to 60 inches, dark-brown (10YR 4/3) shaly silt loam; 20 to 30 percent of horizon is coarse fragments; common, fine, faint mottles of olive brown (2.5Y 4/4) ; weak, thin, platy structure; thin, discontinuous clay films and manganese coatings on ped surfaces; friable when moist; very strongly acid (pH 4.9) ; clear, wavy boundary; 6 to 10 inches thick.

R—60 inches +, light olive-brown, partly weathered shale with thin clay films of light gray on the top.

Depth to mottling ranges from about 20 to 30 inches, and depth to shale ranges from about 50 to 80 inches. Hue ranges from 2.5Y to 7.5YR. In some places many

channery fragments occur throughout the profile. In a few places the lower subsoil is prismatic.

Profile of Watson silt loam in a gently sloping area of a pine plantation in Greenwood Township 1 mile east of Millville (Laboratory No. S60Pa–19–18–(1–11) in tables 10 and 11):

Ap1—0 to 5 inches, dark yellowish-brown (10YR 3/4) silt loam; coarse fragments make up 2 to 3 percent of the horizon; weak, thin to medium, platy structure; very friable when moist; abundant roots; very strongly acid (pH 4.9); clear, wavy boundary; 4 to 6 inches thick.

Ap2—5 to 11 inches, dark-brown (10YR 4/3) silt loam; about 10 percent of horizon is coarse fragments; weak, medium to thick, platy structure breaking to moderate, coarse, granular structure; very friable when moist; abundant roots; very strongly acid (pH 4.8); abrupt, smooth boundary; 6 to 7 inches thick.

B1—11 to 16 inches, strong-brown (7.5YR 5/6) heavy silt loam; 5 to 10 percent of horizon is coarse fragments; weak, fine, subangular blocky structure; thin, discontinuous clay films; friable when moist, slightly sticky and plastic when wet; abundant roots; very strongly acid (pH 5.0); clear, wavy boundary; 4 to 6 inches thick.

B21—16 to 23 inches, yellowish-brown (10YR 5/6) shaly light silty clay loam; 15 to 20 percent of horizon is coarse fragments; moderate, medium, subangular blocky structure; thin, continuous clay films; firm in place when moist, sticky and plastic when wet; abundant roots; very strongly acid (pH 4.9); clear, wavy boundary; 6 to 8 inches thick.

Bx1—23 to 31 inches, light yellowish-brown (2.5Y 6/4) clay loam; 10 to 20 percent of horizon is coarse fragments; common, fine, distinct mottles of strong brown (7.5YR 5/6) and light brownish gray (2.5Y 6/2); weak, coarse, prismatic structure breaking to weak, fine, subangular blocky structure; thin, continuous clay films; very firm in place when moist, sticky and plastic when wet; few roots; strongly acid (pH 5.1); gradual, wavy boundary; 6 to 10 inches thick.

Bx2—31 to 38 inches, brown (7.5YR 5/4) clay loam; 15 to 25 percent of horizon is coarse fragments; many, medium, prominent mottles of yellowish red (5YR 4/8) and light yellowish brown (2.5Y 5/2); light-gray (N 7/0) clay on prism faces ½ to ¾ inch thick; weak, coarse, prismatic structure breaking to moderate, medium, subangular blocky structure; thin, continuous clay films and common, medium, black manganese coats; very firm in place when moist, sticky and plastic when wet; few roots; strongly acid (pH 5.2); clear, irregular boundary; 4 to 12 inches thick.

Bx3—38 to 46 inches, brown (7.5YR 4/6) clay loam; 25 to 30 percent of horizon is coarse fragments; many, coarse, prominent mottles of yellowish red (5YR 5/6) and light brownish gray (2.5Y 6/2); moderate, coarse, prismatic structure breaking to moderate, medium, subangular blocky structure; thin, discontinuous clay films and common, medium, black manganese coats; very firm in place when moist, firm when removed, sticky and plastic when wet; very few roots; medium acid (pH 5.6); gradual, wavy boundary; 7 to 10 inches thick.

Bx4—46 to 54 inches, yellowish-red (5YR 5/6) clay loam; 25 to 30 percent of horizon is coarse fragments; many, coarse, prominent mottles of light gray (N 7/0) and red (2.5YR 4/6); moderate, medium to coarse, prismatic structure breaking to moderate, medium, subangular blocky structure; thin, discontinuous clay films and common, medium, black manganese coats; very firm in place when moist, sticky and plastic when wet; medium acid (pH 5.8); abrupt, smooth boundary; 5 to 10 inches thick.

Bx5—54 to 61 inches, silt loam between very soft fragments; 60 to 70 percent of horizon is coarse fragments; matrix has no discernible color; many, medium, prominent mottles of light gray (N 7/0), strong brown (7.5YR 5/8), and red (2.5YR 4/8); weak, coarse, prismatic structure breaking to weak, very fine, subangular blocky structure; very few, very thin, discontinuous clay films; very firm in place when moist, sticky and plastic when wet; medium acid (pH 5.7); clear, wavy boundary; 6 to 8 inches thick.

C—61 to 69 inches, brown (10YR 4/3) very soft, rotten shale and thin clay layers; common, medium, prominent mottles of strong brown (7.5YR 5/8), yellowish red (5YR 4/8), and light brownish gray (2.5Y 6/2); medium acid (pH 5.6); abrupt, smooth boundary; 7 to 9 inches thick.

C2—69 to 72 inches +, light olive-brown (2.5Y 5/4) shale that is very dark brown (7.5YR 3/4) on the bottom and has thin, continuous films of light-gray (N 7/0) clay on top; medium acid (pH 5.6); more than 3 inches thick.

WEIKERT SERIES

The Weikert series consists of shallow, well-drained soils that formed from acid brown shale and sandstone on rolling hills and till plains. These soils occur in most areas of the county, but not in the extreme northern and southern parts. They are Sols Bruns Acides intergrading toward Lithosols. Weikert soils are the shallow, well drained members of the catena that includes the moderately deep, well drained Hartleton soils, the deep, well drained Allenwood soils, the moderately well drained Watson soils, the somewhat poorly drained Alvira soils, and the poorly drained Shelmadine soils. Associated with this catena are the very poorly drained Lickdale soils. The Weikert soils are similar to the Klinesville soils but are not so red, for the Klinesville soils formed from acid shale and sandstone that was red instead of brown. The forest cover is mostly mixed oak, but there are some beech, maple, hickory, sassafras, and tulip-poplar. Nonstony areas are mostly cleared and used for crops.

Profile of Weikert channery silt loam 4 miles east of Benton in a steeply sloping area of a pine plantation that was formerly cropland and has trees about 5 years old:

Ap—0 to 8 inches, dark-brown (10YR 4/3) channery silt loam; about 40 percent of horizon is coarse fragments; weak, fine, granular structure; friable when moist; plentiful roots; medium acid (pH 5.6); abrupt, smooth boundary; 7 to 8 inches thick.

AC—8 to 20 inches, yellowish-brown (10YR 5/8) very channery silt loam; about 60 percent of horizon is coarse fragments; weak, fine, granular structure; friable when moist; few roots; strongly acid (pH 5.5); clear, wavy boundary; 10 to 12 inches thick.

R—20 inches +, sandstone that has small amount of very gritty silt loam in crevices.

The surface layer is channery silt loam or very stony silt loam. In the stony areas an A1 horizon occurs that is similar to the Ap horizon of the profile described and is overlain by about 1 inch of partly decomposed leaves and 1 or 2 inches of recent litter. Depth to solid bedrock ranges from about 15 inches to several feet. Where the depth to bedrock is more than 2 feet, the R horizon is overlain by a C horizon consisting of sandstone fragments and slightly weathered shale.

WELLSBORO SERIES

The Wellsboro series consists of deep, moderately well drained and somewhat poorly drained soils formed from Wisconsin glacial till that was derived from acid red shale, sandstone, and various erratics on nearly level to gently sloping uplands. These soils are in the northeastern part of the county. They are Sols Bruns Acides. Wellsboro soils are the moderately well drained and somewhat poorly drained members of the drainage sequence that includes the shallow and moderately deep, well drained Oquaga soils, the deep, well drained Lackawanna soils, and the poorly drained and somewhat poorly drained Morris soils. Associated with this catena are the very poorly drained Lickdale soils. Wellsboro soils are similar to Albrights soils, which formed from similar material of pre-Wisconsin age. However, Wellsboro soils are less weathered than Albrights soils, and they normally contain more coarse fragments in the subsoil and lack a textural B horizon. The forest cover was mixed hardwoods and some hemlock, but most areas have been cleared and are used for crops and pasture.

Profile of a moderately eroded Wellsboro soil in gently sloping cropland 1½ miles southeast of Central (Laboratory No. S60Pa.-19-19-(1-8) in tables 10 and 11):

Ap—0 to 7 inches, dark-brown (7.5YR 3/3) loam; 5 to 10 percent of horizon is coarse fragments; weak, medium, granular structure; friable when moist; abundant roots; has been limed; slightly acid (pH 6.4); abrupt, smooth boundary; 6 to 8 inches thick.

B1—7 to 11 inches, reddish-brown (5YR 4/4) loam and few coarse fragments; weak, fine, subangular blocky structure; friable when moist; plentiful roots; medium acid (pH 5.6); clear, wavy boundary; 3 to 6 inches thick.

B21—11 to 18 inches, reddish-brown (2.5YR 4/4) loam; 5 to 10 percent of horizon is coarse fragments; moderate, medium, blocky structure; thin patches of clay film on ped surfaces; friable when moist, slightly sticky when wet; plentiful roots; strongly acid (pH 5.1); abrupt, wavy boundary; 5 to 9 inches thick.

B22—18 to 22 inches, reddish-brown (5YR 4/4) loam; 10 to 15 percent of horizon is coarse fragments; common, medium, distinct mottles of yellowish red (5YR 5/8) and light gray (5YR 6/1); moderate, medium, subangular blocky structure; thin, continuous clay films on ped surfaces; friable when moist; few roots; strongly acid (pH 5.1); abrupt, wavy boundary; 3 to 5 inches thick.

B23—22 to 31 inches, dark reddish-brown (2.5YR 3/4) gravelly fine sandy loam; 15 to 20 percent of horizon is coarse fragments; few, medium, distinct mottles of weak red (10R 5/2); moderate, medium, subangular blocky structure; firm when moist, slightly sticky when wet; no roots; very strongly acid (pH 4.8); gradual, wavy boundary; 6 to 12 inches thick.

Bx1—31 to 42 inches, dusky-red (10R 3/4) gravelly fine sandy loam; 20 to 25 percent of horizon is coarse fragments; few, medium, distinct mottles of weak red (10R 5/2); weak, very coarse, prismatic structure breaking to moderate, medium, platy structure; manganese coatings on ped surfaces; very firm when moist, slightly sticky when wet; very strongly acid (pH 4.6); diffuse, wavy boundary; 8 to 14 inches thick.

Bx2—42 to 52 inches, dusky-red (10R 3/4) gravelly loam; 30 to 35 percent of horizon is coarse fragments; weak, very coarse, prismatic structure breaking to moderate, medium, platy structure; very firm when moist, slightly sticky when wet; very strongly acid pH 4.6); gradual, wavy boundary; 7 to 13 inches thick.

Bx3—52 to 63 inches +, dusky-red (10R 3/4) gravelly loam; 15 to 20 percent of horizon is coarse fragments; weak, very coarse, prismatic structure breaking to moderate, medium, platy structure; firm when moist; very strongly acid (pH 4.6); more than 10 inches thick.

Profile of Wellsboro channery silt loam in gently sloping cropland in Sugarloaf Township about 2 miles east of Central (Laboratory No. S60Pa.-19-20-(1-9) in tables 10 and 11):

Ap—0 to 7 inches, dark-brown (7.5YR 3/2) channery silt loam; 10 to 15 percent of horizon is coarse fragments; weak, medium, granular structure; friable when moist; abundant roots; strongly acid (pH 5.3); abrupt, smooth boundary; 6 to 8 inches thick.

B21—7 to 12 inches, reddish-brown (5YR 4/4) silt loam; 5 to 10 percent of horizon is coarse fragments; moderate, fine to medium, subangular blocky structure; partial clay films; friable when moist; few roots; strongly acid (pH 5.3); clear, wavy boundary; 3 to 7 inches thick.

B22—12 to 17 inches, reddish-brown (5YR 4/4) silt loam; 5 to 10 percent of horizon is coarse fragments; few, fine, faint mottles of reddish brown (5YR 5/3); moderate, medium to fine, subangular blocky structure; distinct, almost continuous clay films; friable when moist, slightly sticky and slightly plastic when wet; very few roots; strongly acid (pH 5.3); clear, wavy boundary; 3 to 7 inches thick.

B23—17 to 24 inches, reddish-brown (5YR 4/4) silt loam; 10 to 15 percent of horizon is coarse fragments; common, medium, distinct mottles of yellowish red (5YR 5/8) and reddish brown (5YR 5/3); moderate, medium to fine, subangular blocky structure; distinct clay films; firm in place when moist, slightly sticky and slightly plastic when wet; very few roots; strongly acid (pH 5.3); abrupt, wavy boundary; 5 to 10 inches thick.

IIB24—24 to 32 inches, dusky-red (10R 3/4) channery fine sandy loam; 25 to 35 percent of horizon is coarse fragments; common, medium, distinct mottles of red (2.5YR 4/6) and weak red (2.5YR 5/2); weak, medium, angular blocky structure; many concretions; distinct clay films; firm when moist, sticky when wet; strongly acid (pH 5.1); clear, wavy boundary; 6 to 10 inches thick.

IIB25—32 to 40 inches, dusky-red (10R 3/4) channery fine sandy loam; 35 to 40 percent of horizon is coarse fragments; moderate, medium, angular blocky structure, partial clay films; few manganese coats; firm when moist, sticky when wet; strongly acid (pH 5.3); gradual, wavy boundary; 6 to 11 inches thick.

IIBx1—40 to 48 inches, dusky-red (10R 3/4) channery fine sandy loam; 30 to 35 percent of horizon is coarse fragments; weak, very coarse, prismatic structure breaking to weak, medium, platy structure; few partial clay films; some manganese films; firm when moist, sticky when wet; medium acid (pH 5.6); gradual, wavy boundary; 6 to 11 inches thick.

IIBx2—48 to 50 inches, dusky-red (10R 3/4) channery fine sandy loam; 30 to 35 percent of horizon is coarse fragments; weak, very coarse, prismatic structure breaking to weak, medium, platy structure; discontinuous clay films; firm when moist, sticky when wet; medium acid (pH 5.7); abrupt, wavy boundary; 1 to 4 inches thick.

R—50 inches +, dusky-red, slightly weathered shale.

The surface layer is channery silt loam or very stony silt loam. Depth to mottling ranges from about 15 to 30 inches. At a depth ranging from 40 to 80 inches, a C horizon occurs. Depth to bedrock is normally more than 4 feet. Nearly all of the coarse fragments are subrounded and less than 3 inches in diameter, but in places some coarse fragments are as much as 10 inches in diam-

eter. The dominant hues are 2.5YR and 5YR. In stony areas the Ap horizon is replaced by a similar A1 horizon that is overlain by a thin mat of organic material.

WESTMORELAND SERIES

The Westmoreland series consists of deep, well-drained soils that formed from calcareous dark-gray shale on gently sloping and moderately sloping uplands. These soils are mainly in the vicinity of Jerseytown. They are Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils. Westmoreland soils occur with the shallow to moderately deep, well drained Litz soils and the moderately well drained Wiltshire soils. They are similar to Allenwood soils but are less red in the subsoil and are less acid. The forest cover was mixed hardwoods, but these soils have been cleared and are used for crops.

Profile of Westmoreland silt loam in gently sloping cropland 2 miles southwest of Millville:

Ap—0 to 9 inches, grayish-brown (10YR 5/2) silt loam; 5 to 10 percent of horizon is coarse fragments; weak, fine, granular structure; friable when moist; plentiful roots; has been limed; neutral (ph 6.8); abrupt, smooth boundary; 8 to 9 inches thick.

B1—9 to 16 inches, light brownish-gray (10YR 6/2) silt loam; 5 to 10 percent of horizon is coarse fragments; weak, fine, subangular blocky structure; friable when moist; few roots; neutral (pH 6.6); clear, wavy boundary; 6 to 8 inches thick.

B21—16 to 27 inches, strong-brown (7.5YR 5/8) shaly heavy silt loam; 15 to 20 percent of horizon is coarse fragments; weak, fine, subangular blocky structure; friable when moist, slightly sticky when wet; thin patches of clay films; few roots; slightly acid (pH 6.3); abrupt, wavy boundary; 10 to 12 inches thick.

B22—27 to 38 inches, yellowish-red (5YR 5/6) shaly silty clay loam; 15 to 25 percent of horizon is coarse fragments; moderate, fine, subangular blocky structure; thick patches of clay films on ped surfaces; firm when moist, sticky when wet; few roots; slightly acid (pH 6.4); clear, wavy boundary; 10 to 12 inches thick.

C—38 to 50 inches, shattered calcareous dark-gray shale that is harder and more calcareous as depth increases; silt and clay on and between fragments.

R—50 inches +, calcareous dark-gray shale.

The subsoil ranges from heavy silt loam to silty clay loam. Depth to shale ranges from about 36 to 60 inches. In some places clay films are more prevalent than in the profile described. The hue in the subsoil is 5YR to 10YR. The percentage of coarse fragments in the solum ranges from 5 to 30 percent and increases with depth. Where the substratum is interbedded acid shale and calcareous shale, the solum is more strongly acid than that described.

WILTSHIRE SERIES

The Wiltshire series consists of deep, moderately well drained soils that formed from limestone in nearly level, gently sloping, and moderately sloping areas. These soils occur in a narrow band that extends in an east-west direction north of the terraces along the Susquehanna River. They are Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils. Wiltshire soils occur with the deep, well-drained Washington and Westmoreland soils and the somewhat poorly drained and poorly drained Allis soils. Wiltshire soils are similar to Watson soils but can be distinguished from them by higher reaction and normally the underlying calcareous shale or limestone. The forest cover was mixed hardwoods, but the area has been cleared and is used for crops.

Profile of Wiltshire silt loam in a nearly level cultivated field 1 mile west of Jerseytown:

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam containing a few coarse fragments; weak, medium, granular structure; friable when moist; abundant roots; has been limed; neutral (pH 6.8); abrupt, smooth boundary; 7 to 9 inches thick.

B1—8 to 13 inches, yellowish-brown (10YR 5/8) silty clay loam containing few coarse fragments; weak, medium, granular structure; friable when moist, slightly sticky when wet; plentiful roots; neutral (pH 6.9); clear, wavy boundary; 4 to 6 inches thick.

B21—13 to 18 inches, strong-brown (7.5YR 5/8) silty clay loam; 5 to 10 percent of horizon is coarse fragments; moderate, fine, subangular blocky structure; friable when moist, slightly sticky when wet; plentiful roots; medium acid (pH 5.8); clear, wavy boundary; 4 to 6 inches thick.

B22g—18 to 28 inches, gray (N 6/0) silty clay loam; 10 to 20 percent of horizon is coarse fragments; many, fine, prominent mottles of strong brown (7.5YR 5/8); moderate, medium, blocky structure; thin, discontinuous clay films on ped surfaces; firm when moist, sticky when wet; no roots; medium acid (pH 5.9); abrupt, smooth boundary; 9 to 11 inches thick.

Bx—28 to 34 inches, light-gray (10YR 7/1) clay loam; 10 to 20 percent of horizon is coarse fragments; many, medium, prominent mottles of strong brown (7.5YR 5/8) and yellowish-red (5YR 5/6); moderate, medium, platy structure; thick, continuous clay films on ped surfaces; firm when moist, sticky when wet; medium acid (pH 5.9); clear, wavy boundary; 5 to 7 inches thick.

B31—34 to 37 inches, strong-brown (7.5YR 5/6) clay loam; 10 to 20 percent of horizon is coarse fragments; common, medium, prominent mottles of light gray (10YR 7/1); weak, medium, blocky structure; thin, discontinuous clay films on ped surfaces; slightly firm when moist, sticky when wet; slightly acid (pH 6.1); abrupt, wavy boundary; 2 to 4 inches thick.

B32—37 to 45 inches, reddish-yellow (7.5YR 6/8) clay loam; 10 to 20 percent of horizon is coarse fragments; common, fine, prominent mottles of grayish brown (10YR 5/2); weak, fine, subangular blocky structure; friable when moist, sticky when wet; slightly acid (pH 6.1); abrupt, smooth boundary; 7 to 8 inches thick.

R—45 inches +, partly weathered limestone with reddish-yellow (7.5YR 6/8) clay loam in cracks.

Depth to mottling ranges from about 16 to 30 inches, and depth to bedrock ranges from about 40 to 80 inches. Where they occur with Belmont soils, the Wiltshire soils are redder throughout the profile than the soil described and their subsoil contains many small pieces of calcareous red shale. Where they occur with Westmoreland soils, Wiltshire soils are grayer than they are in areas where they occur with Washington soils. In some places a thin mantle of silt and very fine sand is on the surface. This mantle is part or all of the Ap horizon, and it is underlain by an A2 horizon that is similar to the Ap horizon of the profile described.

WOOSTER SERIES

The Wooster series consists of deep, well-drained soils formed from Wisconsin glacial till that was derived from acid gray sandstone, shale, and various erratics. These

soils are in gently sloping and moderately sloping areas of the northern part of the county. They are Gray-Brown Podzolic soils. Wooster soils are the deep, well drained members of the catena that includes the shallow to moderately deep, well drained Lordstown soils, the moderately well drained and somewhat poorly drained Canfield soils, and the poorly drained and somewhat poorly drained Ravenna soils. Associated with this catena are the very poorly drained Lickdale soils. Wooster series are similar to Allenwood soils but are coarser textured and less weathered. In the subsoil the Wooster soils lack the red hues of the Allenwood soils. The forest cover was mostly oak and some maple, beech, ash, hickory, and hemlock, but most nonstony areas have been cleared and are used for crops.

Profile of Wooster channery silt loam in gently sloping cropland about 2 miles southwest of Benton:

Ap—0 to 7 inches, very dark grayish-brown (10YR 3/2) channery silt loam; 15 to 20 percent of horizon is coarse fragments; moderate, fine, granular structure; friable when moist; plentiful roots; has been limed; slightly acid (pH 6.4); abrupt, smooth boundary; 6 to 8 inches thick.

A2—7 to 10 inches, yellowish-brown (10YR 5/4) channery silt loam; 15 to 20 percent of horizon is coarse fragments; weak, thin, platy structure breaking to moderate, fine, granular structure; friable when moist, slightly sticky when wet; few roots; slightly acid (pH 6.2); clear, wavy boundary; 2 to 4 inches thick.

B1—10 to 17 inches, yellowish-brown (10YR 5/4) channery heavy silt loam; 15 to 20 percent of horizon is coarse fragments; moderate, fine to medium, subangular blocky structure; friable when moist, slightly sticky and slightly plastic when wet; few roots; strongly acid (pH 5.2); gradual, wavy boundary; 6 to 9 inches thick.

B21—17 to 23 inches, yellowish-brown (10YR 5/4) gritty channery heavy silt loam; 10 to 20 percent of horizon is coarse fragments; moderate, medium, subangular blocky structure; thin, discontinuous clay films on peds; friable when moist, slightly sticky and slightly plastic when wet; few roots; strongly acid (pH 5.4); clear, wavy boundary; 5 to 7 inches thick.

B22—23 to 29 inches, yellowish-brown (10YR 5/4) channery heavy silt loam; 20 to 30 percent of horizon is coarse fragments; weak, medium, platy structure breaking to moderate, fine, subangular blocky structure; thin, discontinuous clay films on ped surfaces; slightly firm when moist, slightly sticky and slightly plastic when wet; few roots; very strongly acid (pH 5.0); gradual, wavy boundary; 5 to 8 inches thick.

B23—29 to 40 inches, dark yellowish-brown (10YR 4/4) very gritty channery silt loam; 20 to 30 percent of horizon is coarse fragments; few, fine, faint mottles of dark brown (7.5YR 4/4); moderate, medium, platy structure breaking to moderate, fine, subangular blocky structure; thin, discontinuous clay films on stones; firm when moist, nonsticky and nonplastic when wet; no roots; very strongly acid (pH 4.8); clear, wavy boundary; 10 to 12 inches thick.

Bx—40 to 47 inches, dark-brown (7.5YR 4/4) channery heavy silt loam; 20 to 30 percent of horizon is coarse fragments; few, fine, faint mottles of dark yellowish brown (10YR 4/4); weak, medium to thick, platy structure breaking to moderate, medium, subangular blocky structure; thin, discontinuous silt films on stones; very firm when moist, slightly sticky and slightly plastic when wet; strongly acid (pH 5.2); clear, wavy boundary; 6 to 8 inches thick.

C—47 to 62 inches, yellowish-brown (10YR 5/4) channery silty clay; 15 to 20 percent of horizon is coarse fragments; many, fine, distinct mottles of light brownish gray (2.5Y 6/2) and yellowish red (5YR 5/8); weak, thick, platy structure breaking to moderate, medium, blocky structure; thin, discontinuous clay films on ped surfaces; slightly firm when moist, sticky and plastic when wet; strongly acid (pH 5.4); clear, wavy boundary; 14 to 16 inches thick.

IIC—62 inches +, coarse sand.

The surface layer is channery silt loam and very stony silt loam. Below a depth of 5 feet, the profile is nonconforming. In many places the upper C horizon is underlain by another C horizon that consists of sandstone and shale fragments and a small amount of silt loam in cracks between the fragments. Depth to the C horizon is normally 3 to 4 feet, and depth to bedrock is 4 to 8 feet. The mottles at a depth of less than 36 inches are few, fine, and faint. In many places mottling does not occur in the profile. Clay films are commonly more conspicuous than in the profile described. In stony areas the Ap horizon is replaced by a similar A1 horizon, which is overlain by a thin mantle of partly decomposed leaves.

ZIPP SERIES

The Zipp series consists of deep, poorly drained and very poorly drained Humic Gley soils formed in sediments that have been influenced by lime. These soils are in nearly level areas that appear to be old lake bottoms. They are along the headwaters of the West Branch of Briar Creek and in the vicinity of Jerseytown. Zipp soils are finer textured and more alkaline than Atherton soils and generally are deeper to the C horizon. The native vegetation consisted of swamp forest mixed with some pine, larch, and hemlock, but most areas have been cleared and are used for crops.

Profile of Zipp silt loam in nearly level cropland 5 miles east of Light Street:

Ap—0 to 8 inches, grayish-brown (2.5Y 5/2) heavy silt loam containing few coarse fragments; fine distinct mottles of strong brown (7.5YR 5/8) and light gray (N 7/0); moderate, fine subangular blocky structure; friable when moist; plentiful roots in top 3 inches, few below; slightly acid (pH 6.3); abrupt, smooth boundary; 7 to 9 inches thick.

B21g—8 to 24 inches, gray (10YR 6/1) silty clay loam containing few coarse fragments; many, fine, prominent mottles of reddish yellow (5YR 6/6); weak, medium, columnar structure breaking to moderate, fine, subangular blocky structure; very firm when moist, slightly sticky and nonplastic when wet; few roots to a depth of 18 inches, none below; medium acid (pH 5.8); clear, wavy boundary; 15 to 18 inches thick.

B22g—24 to 40 inches, gray (10YR 6/1) silty clay; 5 to 10 percent of horizon is coarse fragments; many, medium, prominent mottles of yellowish red (5YR 5/8); weak, medium, columnar structure breaking to moderate, medium, subangular blocky structure; firm when moist, slightly sticky and plastic when wet; medium acid (pH 5.7); gradual, irregular boundary; 12 to 20 inches thick.

IICx—40 to 48 inches +, brown (7.5YR 4/4) gritty gravelly silt loam; 30 to 40 percent of horizon is coarse fragments; weak, fine, granular structure tending toward massive; extremely firm when moist, nonsticky when wet; slightly acid (pH 6.1); more than 8 inches thick.

In some places where the soil has recently received deposits from higher areas, there is a thin Ap2 horizon. In some places the B21 horizon is less than 12 inches thick, and depth to the C horizon is only 3 feet. The texture and reaction of the C horizon vary widely.

Laboratory Data [5]

Samples of the Alvira, Chenango, Hartleton, Lackawanna, Lawrenceville, Leck Kill, Shelmadine, Watson, and Wellsboro soils were taken at the specified locations in Columbia County and analyzed by the Soil Characterization Laboratory of the Pennsylvania State University. Except for the Chenango and Wellsboro soils, samples for each of these soil series were taken at two sites where slopes and erosion were average and the soils were in a common land use.

Data obtained from these samples are shown in tables 10 and 11. The sampling and the analytical methods used are discussed in the paragraphs that follow. The profiles of the soils analyzed are described in the section "Formation and Classification of Soils."

PHYSICAL PROPERTIES

Data on the physical properties of selected soils are reported in table 10. In preparing the soil material for laboratory analysis, air-dry samples were crushed with a rolling pin so that the material would pass through a sieve having round holes 2 millimeters in diameter. Care was taken to avoid fragmenting the nonsoil material. The percentage of material retained by this sieve is reported in table 10 in the column headed "Coarse fragments greater than 2 mm." Except for bulk density, all laboratory determinations in tables 10 and 11 are for only that part of the sample consisting of particles 2 millimeters or less in diameter.

Analysis for particle-size distribution reported in table 10 was made by the pipette method, as described by Kilmer and Alexander (*5*) and Kilmer and Mullins (*6*). The particles were dispersed in sodium hexametaphosphate by mechanical shaking.

Bulk density, expressed in grams per cubic centimeter, was determined on 1- by 2-inch cylindrical core samples in a modified Uhland core sampler (*13*, *14*).

Moisture held at a tension of 1/3 atmosphere was determined by testing core samples on a porous plate (*14*). Moisture held at a tension of 15 atmospheres was determined by testing fragmented samples in a pressure-membrane aparatus (*9*).

CHEMICAL PROPERTIES

Data on chemical properties of selected soils are reported in table 11. Organic carbon was determined by wet combustion; the procedure was a modification of the Walkley-Black method (*7*).

Total nitrogen was determined by the Kjeldahl method (*2*), which was modified by trapping ammonia in a boric acid solution and then titrating with sulfuric acid.

Extractable hydrogen, calcium, magnesium, sodium, potassium, and the cation exchange capacity were determined by extraction with neutral normal ammonium acetate (*7*). The cation exchange capacity was determined by summation of exchangeable cations and by the distillation of absorbed ammonia after extraction with sodium chloride. Extractable sodium and potassium were determined by a flame photometer.

The reaction was determined with a glass electrode in a soil-water ratio of 1 to 1.

Clay minerals were identified by means of a Norelco X-ray spectrometer equipped with a Geiger counter and chart recorder and using a copper target. Flat-oriented clay samples (less than 2 microns), in the form of a thin film on a glass slide, were analyzed as magnesium saturated-water solvated, as magnesium saturated-glycerol solvated, and as potassium saturated-water solvated specimens. Prior to saturation, organic matter was removed from the clay by treatment with 10 percent hydrogen peroxide, and free iron oxides were removed by the method developed by Jeffries (*4*).

Interpretation of Clay Minerals [6]

The clay fraction of soil may have been inherited from parent rock or it may have formed through weathering in place of preexisting minerals. In both instances the soil-forming processes leading to the development of a soil profile can produce differences in the relative distribution of clay mineral types as a function of depth. As a result, data on the mineral composition of the clays within a soil profile can be interpreted in terms of soil genesis.

The kinds of minerals occurring within the clay fraction in the soils of Pennsylvania are few. In addition to the clay minerals, several other kinds of minerals may be present in small amounts. Quartz and feldspars are at the coarsest end of the particle-size range for clay. Quartz is most prominent in the surface horizon. The iron oxide minerals, goethite and lepidocrocite, and hydrated amorphus types occur mainly as surface coatings. Generally, the surface coatings are removed before the soil is analyzed so as to facilitate soil dispersion and identification of the minerals by X-ray methods. Although gibbsite, $Al(OH)_3$, has been identified in some of the soils in Pennsylvania its occurrence is very limited. Amorphous silica and silicate materials may occur in small or moderate amounts, but they are not detected by the techniques now in use.

Primary attention was focused on the mineralogical analysis of the clay minerals that are the major components of the clay fraction. In terms of crystal structure, the clay minerals are part of a group called layer lattice silicate and make up a number of specific types. These minerals are most commonly identified by measuring the distance between the unit layers by X-ray diffraction techniques, and they are designated as 7, 10, and 14 Å (angstrom) types. Dioctahedral and trioctahedral refer to the number of cations, two and three respectively, that occupy the three sites available for the cations within a unit layer of the crystal lattice. The term "interstratification" refers to interlayering or mixed layering and denotes that the unit layers of one clay mineral are stacked together with the unit layers of another clay min-

[5] Laboratory analyses made by R. P. MATELSKI, C. F. ENGLE, and E. C. MASON, Pennsylvania Agricultural Experiment Station, Pennsylvania State University.

[6] Prepared by L. J. JOHNSON, Department of Agronomy, Pennsylvania State University.

TABLE 10.—*Physical*

[Absence of data indicates

Soil name, sample number, and location	Horizon	Depth	Coarse fragments (greater than 2.0 mm.)	Particle size distribution: Very coarse sand (2.0 to 1.0 mm.)	Coarse sand (1.0 to 0.5 mm.)	Medium sand (0.5 to 0.25 mm.)
		Inches	*Percent by weight*	*Percent*	*Percent*	*Percent*
Alvira shaly silt loam: S59Pa.-19-10-(1-9) (1¾ miles northeast of Rohrsburg)	Ap	0-9	38. 9	6. 0	4. 2	3. 1
	B1	9-14	32. 6	5. 8	4. 3	3. 0
	B21	14-20	31. 3	3. 7	3. 2	2. 1
	B22	20-29	42. 7	4. 1	3. 9	2. 8
	Bx1	29-32	67. 0	6. 4	5. 4	3. 7
	Bx2	32-37	62. 6	3. 1	3. 1	3. 1
	Bx3	37-45	60. 6	6. 2	7. 0	5. 8
	B31	45-50	63. 8	6. 6	7. 2	6. 2
	B32	50+	16. 4	1. 3	1. 3	1. 9
Alvira shaly silt loam: S59Pa.-19-5-(1-8) (¾ mile southwest of Rohrsburg)	Ap	0-10	28. 3	. 7	. 5	3. 1
	B21	10-13	39. 6	. 4	. 9	1. 7
	B22	13-18	38. 4	. 7	1. 3	2. 1
	B23	18-22	24. 4	2. 0	2. 3	2. 6
	Bx1	22-32	27. 3	2. 2	3. 1	3. 3
	Bx2	32-42	11. 3	1. 7	2. 2	2. 6
	Bx3	42-51	5. 8	1. 3	1. 3	1. 7
	C	51-60	3. 2	<. 1	. 1	. 3
Chenango gravelly sandy loam: S59Pa.-19-16-(1-4) (3 miles east of Bloomsburg)	Ap	0-10	58. 7	3. 0	7. 2	13. 5
	B2	10 16	52. 5	5. 0	8. 9	11. 8
	B3	16-21	82. 9	17. 0	20. 6	11. 4
	C	21-48	88. 5	13. 9	22. 6	11. 5
Hartleton channery silt loam: S59Pa.-19-4-(1-6) (2 miles northwest of Rohrsburg)	Ap	0-8	36. 4	4. 3	3. 2	3. 9
	B1	8-12	36. 1	3. 4	3. 2	3. 5
	B21	12-20	36. 6	3. 7	3. 6	3. 8
	B22	20-28	36. 6	3. 6	4. 1	4. 9
	B3	28-34	36. 6	4. 8	4. 3	5. 2
	C	34-40	40. 0	4. 9	4. 6	5. 3
Hartleton channery silt loam: S59Pa.-19-14-(1-5) (2 miles southeast of Bloomsburg)	Ap	0-9	71. 5	5. 5	3. 4	2. 2
	B1	9-13	54. 9	4. 7	4. 9	3. 7
	B21	13-20	62. 2	5. 7	6. 4	4. 4
	B22	20-26	69. 4	4. 3	7. 1	5. 4
	B3	26-31	67. 8	7. 7	8. 6	6. 2
Lackawanna channery loam: S59a.-19-8-(1-9) (1½ miles northwest of Divide)	Ap	0-8	29. 4	2. 4	4. 1	12. 1
	A2	8-12	41. 1	2. 1	4. 9	12. 2
	B1	12-17	31. 8	1. 9	4. 9	12. 8
	B21	17-24	30. 0	1. 5	4. 6	13. 0
	B22	24-32	23. 5	2. 1	5. 3	13. 5
	B23	32-38	25. 1	3. 2	5. 7	14. 5
	B31	38-45	25. 5	2. 7	5. 0	13. 4
	B32	45-50	22. 3	3. 0	5. 4	13. 4
	C	50-54	27. 9	2. 8	5. 5	13. 9
Lackawanna channery loam: S59Pa.-19-9-(1-8) (1½ miles east of Coles Creek)	Ap	0 6	15. 0	1. 4	2. 5	7. 1
	A2	6-10	28. 9	2. 0	3. 4	8. 7
	B1	10-16	35. 3	4. 8	5. 8	12. 6
	B21	16-22	23. 9	3. 3	5. 4	12. 1
	B22	22-32	30. 8	3. 6	5. 0	13. 0
	B23	32-44	25. 8	3. 9	5. 1	12. 7
	Bx	44-51	42. 9	8. 8	7. 8	7. 8
	C	51+	56. 3	9. 1	7. 3	8. 7
Lawrenceville silt loam: S59Pa.-19-11-(1-10) (1 mile east of Bloomsburg)	Ap	0-8	. 0	. 3	. 8	2. 1
	A2	8-14	. 0	. 2	. 3	3. 7
	B21	14-19	. 0	. 1	. 3	1. 7
	B22	19-24	1. 9	. 9	. 6	2. 6
	B23	24-30	. 0	1. 1	. 9	3. 7
	B24	30-35	. 0	1. 9	1. 3	4. 9
	Bx1	35-41	6. 0	. 9	1. 3	4. 0
	Bx2	41-44	4. 2	. 7	1. 4	2. 4
	Bx3	44-55	4. 0	. 9	1. 9	3. 7
	C	55-64	2. 5	. 3	1. 0	4. 7

properties of selected soils

value is not determined]

Particle size distribution—Continued: Fine sand (0.25 to 0.10 mm.)	Very fine sand (0.10 to 0.05 mm.)	Silt (0.05 to 0.002 mm.)	Clay (less than 0.002 mm.)	Bulk density	Moisture held at tension of—: ⅓ atmosphere	15 atmospheres	Moisture-holding capacity
Percent	*Percent*	*Percent*	*Percent*	*Gm. per cu. cm.*	*Percent*	*Percent*	*Inches per inch*
3.3	7.0	56.0	20.4	1.28	22.7	8.3	0.18
2.7	6.4	55.9	21.9	1.44	19.2	8.1	.16
1.9	5.5	56.4	27.2	1.48	19.3	10.1	.14
2.4	5.9	52.1	28.8	1.48	19.4	10.6	.13
3.2	5.7	49.1	26.5	----------	----------	10.1	----------
3.5	7.8	56.5	22.9	----------	----------	10.2	----------
5.2	8.7	45.0	22.1	----------	----------	9.1	----------
4.6	7.3	47.2	20.9	----------	----------	9.3	----------
3.9	11.2	56.5	23.9	----------	----------	10.0	----------
3.1	7.7	64.4	20.5	1.26	19.7	9.2	.13
2.7	7.2	59.6	27.5	1.44	17.5	10.7	.10
3.0	7.7	57.5	27.7	1.41	17.7	11.5	.09
3.4	7.1	59.8	22.8	1.51	19.1	9.8	.14
3.7	7.2	56.3	24.2	1.55	18.7	8.4	.16
3.3	6.3	58.9	25.0	1.74	16.8	9.3	.13
2.3	5.4	63.3	24.7	1.76	16.4	11.1	.09
.6	3.9	73.5	21.6	----------	----------	11.3	----------
17.2	16.1	32.9	10.1	----------	----------	7.2	----------
16.8	15.1	30.3	12.1	----------	----------	4.5	----------
10.2	7.5	20.9	12.4	----------	----------	5.1	----------
10.9	6.6	21.8	12.7	----------	----------	5.7	----------
5.5	9.7	58.4	15.0	1.32	17.9	7.3	.14
4.9	8.7	59.3	17.0	1.54	12.9	8.0	.08
5.4	9.3	56.1	18.1	1.55	14.2	8.6	.09
6.9	10.4	49.8	20.3	1.63	13.9	8.4	.09
7.5	10.9	46.4	20.9	1.72	12.2	7.9	.07
7.6	11.0	47.2	19.4	----------	----------	7.5	----------
3.2	8.2	58.6	18.9	----------	----------	7.9	----------
3.7	7.1	50.6	25.3	----------	----------	9.9	----------
4.2	6.7	45.6	27.0	----------	----------	11.9	----------
4.3	6.7	43.7	28.5	----------		12.4	----------
5.4	7.5	41.2	23.4	----------	----------	10.8	----------
12.4	7.9	45.8	15.3	1.42	15.6	4.8	.15
11.6	8.3	44.7	16.2	1.58	11.2	7.6	.06
14.2	9.3	38.7	18.2	1.69	11.8	9.4	.04
13.9	8.9	33.8	24.3	1.68	12.8	11.0	.03
15.4	9.6	32.6	21.5	1.70	12.2	10.0	.04
14.6	9.7	34.2	18.1	1.72	14.3	9.2	.09
15.0	10.2	35.5	18.2	1.83	12.1	6.6	.10
15.8	10.5	32.0	19.9	1.79	12.4	2.7	.17
14.6	10.3	34.2	18.7	----------	----------	3.5	----------
11.4	12.6	48.3	16.7	1.25	20.0	9.4	.13
13.7	14.4	43.3	14.5	1.57	15.4	6.6	.14
16.3	14.2	32.6	13.7	1.73	12.4	4.7	.13
16.6	13.4	35.4	13.8	1.80	9.6	4.9	.08
16.1	12.7	36.9	12.7	1.84	10.8	5.0	.11
15.6	13.2	34.2	15.3	1.84	11.4	3.0	.15
11.7	15.2	34.5	14.2	----------	----------	1.6	----------
13.6	15.3	33.0	13.0	----------	----------	1.3	----------
6.4	17.4	61.3	11.7	1.22	20.4	5.8	.18
4.7	17.5	58.5	15.1	1.40	18.7	6.0	.18
6.4	19.7	54.9	16.9	1.50	19.2	6.8	.19
11.2	26.6	46.6	11.5	----------	----------	5.0	----------
14.1	28.0	40.9	11.3	----------	----------	4.8	----------
12.6	25.7	41.6	12.0	----------	----------	4.8	----------
6.7	13.0	61.3	12.8	----------	----------	6.3	----------
3.1	8.9	62.8	20.7	----------	----------	9.2	----------
6.0	11.9	56.6	19.0	----------	----------	8.7	----------
15.8	30.7	38.3	9.2	----------	----------	7.2	----------

TABLE 10.—*Physical*

Soil name, sample number, and location	Horizon	Depth	Coarse fragments (greater than 2.0 mm.)	Particle size distribution: Very coarse sand (2.0 to 1.0 mm.)	Coarse sand (1.0 to 0.5 mm.)	Medium sand (0.5 to 0.25 mm.)
		Inches	*Percent by weight*	*Percent*	*Percent*	*Percent*
Lawrenceville silt loam: S59Pa.-19-12-(1-11) (1 mile west of Bloomsburg)	Ap	0-9	0.0	0.5	0.6	1.5
	A2	9-12	.0	.3	.5	1.5
	B1	12-17	.0	.1	.3	1.3
	B21	17-25	.0	.1	.6	1.9
	B22	25-32	0.5	.3	.8	2.9
	Bx1	32-36	2.4	.2	.8	4.2
	Bx2	36-41	.0	.1	.7	6.1
	Bx3	41-46	.0	.3	.9	5.4
	B31	46-57	.7	.2	.4	2.9
	B32	57-66	.0	.1	1.0	3.7
	B33	66-72	6.1	1.0	2.4	2.9
Leck Kill channery silt loam: S59Pa.-19-13-(1-5) (3 miles southwest of Catawissa)	Ap	0-8	11.6	1.5	1.5	4.9
	B21	8-15	7.2	1.9	2.4	6.3
	B22	15-24	22.1	2.9	3.7	6.9
	B3	24-29	50.8	5.1	6.2	8.2
	C	29-37	61.9	9.2	12.2	10.8
Leck Kill channery silt loam: S59Pa.-19-15-(1-5) (1 mile east of Mainville)	Ap	0-10	28.5	2.2	2.8	2.7
	B1	10-14	24.1	1.7	2.0	2.1
	B21	14-23	26.3	2.2	2.6	2.7
	B22	23-27	30.4	3.6	3.2	3.1
	B3	27-32	42.4	3.7	4.9	4.3
Shelmadine silt loam: S59Pa.-19-2-(1-8) (2 miles southwest of Rohrsburg)	Ap	0-8	.1	.3	.9	1.5
	B1	8-11	.2	.9	.5	1.3
	B21	11-15	.6	.1	.1	.3
	B22	15-22	2.7	.1	.1	.1
	B23	22-32	4.1	.1	.1	.1
	Bx1	32-36	9.1	.4	.6	.9
	Bx2	36-42	16.0	1.6	1.7	1.8
	C	42-50	25.2	2.0	2.1	2.8
Shelmadine silt loam: S59Pa.-19-6-(1-9) (¾ mile southwest of Rohrsburg)	Ap	0-9	22.8	.2	1.1	2.2
	A2g	9-11	32.9	.1	.7	1.2
	B1g	11-16	27.4	.1	.6	1.4
	B21g	16-23	32.7	.4	.8	2.3
	B22	23-31	23.9	1.3	1.9	4.3
	Bx1	31-39	11.0	0.5	1.0	2.3
	Bx2	39-42	18.6	1.7	2.4	3.2
	IIC1	42-47	0.2	.1	.2	1.1
	IIC2	47-58	0.2	.0	.1	.2
Watson silt loam: S59Pa.-19-7-(1-8) (½ mile southwest of Rohrsburg)	Ap	0-8	19.2	1.8	1.7	3.0
	B1	8-13	9.5	1.6	1.2	1.9
	B21	13-18	16.4	1.4	1.6	2.5
	B22	18-24	35.4	3.4	3.1	3.9
	Bx1	24-35	33.3	3.7	3.7	5.1
	Bx2	35-43	26.0	5.0	4.1	5.3
	Bx3	43-52	26.3	4.3	4.4	5.4
	C	52-60	41.8	3.1	4.1	5.3
Watson silt loam: S60Pa.-19-18-(1-11) (1 mile east of Millville)	Ap1	0-5	4.8	.8	1.8	2.1
	Ap2	5-11	17.7	2.7	3.0	2.8
	B1	11-16	20.7	2.8	2.4	2.3
	B2	16-23	33.7	2.4	2.8	2.1
	Bx1	23-31	22.5	5.9	5.0	3.5
	Bx2	31-38	32.8	5.2	5.4	3.4
	Bx3	38-46	46.8	5.4	6.8	4.0
	Bx4	46-54	45.4	4.7	7.2	5.3
	Bx5	54-61	59.8	7.8	8.2	4.2
	C1	61-69	65.4	8.2	8.1	4.4
	C2	69-72	67.7	7.3	9.4	5.6

properties of selected soils—Continued

				Bulk density	Moisture held at tension of—		Moisture-holding capacity
Fine sand (0.25 to 0.10 mm.)	Very fine sand (0.10 to 0.05 mm.)	Silt (0.05 to 0.002 mm.)	Clay (less than 0.002 mm.)		⅓ atmosphere	15 atmospheres	
Percent	*Percent*	*Percent*	*Percent*	*Gm. per cu. cm.*	*Percent*	*Percent*	*Inches per inch*
5.0	18.9	61.2	12.3	1.34	23.5	7.1	0.22
5.4	19.7	60.3	12.3	1.34	20.8	6.2	.20
4.9	20.0	59.0	14.4	1.44	13.8	6.6	.10
5.9	20.2	55.9	15.4	1.60	14.2	6.8	.12
8.3	24.4	49.5	13.8	1.59	13.6	6.4	.11
11.4	28.9	42.7	11.8	1.50	9.0	5.3	.05
22.6	32.4	30.2	7.9	1.41	6.3	4.3	.03
14.8	29.9	37.3	11.4	1.51	----------	5.0	----------
15.9	31.3	44.7	4.6	1.50	----------	3.2	----------
8.5	25.4	51.1	10.2	----------	----------	4.6	----------
4.6	15.9	50.0	23.2	----------	----------	9.6	----------
17.0	14.6	43.6	16.9	----------	----------	6.8	----------
16.4	12.5	35.7	24.8	----------	----------	9.9	----------
7.1	23.4	31.8	24.2	----------	----------	10.7	----------
14.1	9.6	28.4	28.4	----------	----------	13.1	----------
10.4	6.4	22.9	28.1	----------	----------	14.1	----------
3.8	7.2	66.3	15.0	----------	----------	8.5	----------
4.3	8.0	57.3	24.6	----------	----------	9.2	----------
5.4	9.2	52.0	25.9	----------	----------	10.6	----------
5.3	9.7	51.3	23.8	----------	----------	9.9	----------
7.4	8.6	43.4	27.7	----------	----------	11.2	----------
1.4	2.6	68.3	25.0	1.22	29.8	10.8	.23
1.2	2.4	64.2	29.5	1.22	30.5	12.4	.23
.4	1.6	53.1	44.5	1.33	30.2	17.2	.17
.3	3.0	57.9	38.7	1.36	27.4	15.2	.17
.1	1.5	64.9	33.5	1.45	27.9	13.5	.18
1.2	3.8	66.6	26.5	1.68	20.2	10.4	.16
2.4	6.8	66.6	19.1	1.70	18.0	7.9	.17
3.3	6.8	62.0	21.0	----------	----------	8.8	----------
2.9	6.3	66.2	21.1	1.39	26.8	10.4	.23
2.1	5.6	65.3	25.1	1.49	26.7	11.9	.22
2.1	8.2	63.5	24.1	1.50	24.0	10.7	.20
3.0	10.1	63.3	20.1	1.50	21.8	9.2	.19
3.2	16.0	59.9	13.4	1.66	18.7	6.6	.20
3.5	26.1	56.3	10.3	1.70	16.1	4.9	.19
4.0	25.5	50.9	12.3	1.47	25.5	8.0	.26
3.3	40.0	46.8	8.6	1.64	13.7	4.2	.16
1.2	30.4	64.5	3.6	----------	----------	3.4	----------
4.5	8.5	64.8	15.7	1.21	24.3	8.5	.19
3.0	7.9	67.4	17.0	1.32	23.3	6.1	.23
3.5	8.5	61.4	21.1	1.47	21.1	8.7	.18
5.8	9.2	54.3	20.3	1.44	17.0	8.2	.13
6.4	10.1	48.3	22.7	1.56	14.2	9.9	.07
6.9	11.5	50.3	16.9	1.64	13.3	8.6	.08
6.9	12.8	48.9	17.3	----------	----------	7.7	----------
6.8	9.7	51.8	19.2	----------	----------	10.1	----------
2.8	4.8	73.4	14.3	1.06	27.9	10.1	.19
3.1	6.1	64.8	17.5	1.29	21.9	8.4	.17
2.2	4.3	62.3	23.7	1.43	20.7	9.5	.16
2.1	4.2	55.6	30.8	1.50	20.8	12.5	.12
3.0	4.4	47.9	30.3	1.64	18.8	12.8	.10
2.5	3.6	43.8	36.1	1.69	17.9	13.7	.07
2.8	2.3	39.7	39.0	1.52	20.3	15.9	.07
3.1	2.1	42.0	35.6	1.68	18.2	14.9	.06
1.9	1.1	44.2	32.6	1.67	18.7	13.6	.09
2.0	1.1	45.9	30.3	----------	----------	12.0	----------
3.2	2.2	45.4	26.9	----------	----------	----------	----------

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TABLE 10.—*Physical*

Soil name, sample number, and location	Horizon	Depth	Coarse fragments (greater than 2.0 mm.)	Particle size distribution		
				Very coarse sand (2.0 to 1.0 mm.)	Coarse sand (1.0 to 0.5 mm.)	Medium sand (0.5 to 0.25 mm.)
		Inches	*Percent by weight*	*Percent*	*Percent*	*Percent*
Wellsboro channery silt loam: S60Pa.-19-20-(1-9) (2 miles east of Central)	Ap	0-7	21.9	1.3	3.2	7.2
	B21	7-12	18.4	1.0	2.7	5.9
	B22	12-17	17.2	1.1	2.9	6.6
	B23	17-24	24.1	2.0	3.5	7.1
	IIB24	24-32	51.0	5.5	9.3	14.0
	IIB25	32-40	63.0	5.3	8.2	14.6
	IIBx1	40-48	53.5	5.0	8.3	14.7
	IIBx2	48-50	44.2	3.5	7.7	13.7
	R	50+				
Wellsboro silt loam: S60Pa.-19-19-(1-8) (1½ miles southeast of Central):	Ap	0-7	1.2	2.0	7.1	11.4
	B1	7-11	1.6	2.4	7.7	11.6
	B21	11-18	1.5	3.4	8.4	13.9
	B22	18-22	1.7	4.3	9.3	15.5
	B23	22-31	3.1	4.9	10.6	16.8
	Bx1	31-42	2.7	4.6	10.6	17.2
	Bx2	42-52	3.4	5.5	11.2	14.3
	Bx3	52-63	2.9	5.5	12.9	15.6

TABLE 11.—*Chemical*

[Absence of data indicates

Soil name, sample number, and location	Horizon	Depth	Organic carbon	Nitrogen	Carbon-nitrogen ratio	Extractable cations (milliequivalents per 100 grams of soil)				
						Calcium	Magnesium	Sodium	Potassium	Hydrogen
		Inches	*Percent*	*Percent*						
Alvira shaly silt loam: S59Pa.-19-10-(1-9) (1¾ miles northeast of Rohrsburg)	Ap	0-9	1.90	0.163	12	9.5	0.3	0.1	0.1	4.4
	B1	9-14	.39	.078	5	4.1	.1	.1	<.1	6.0
	B21	14-20	.21	.076	(1)	3.3	.2	.1	<.1	8.4
	B22	20-29	.16			2.1	.5	.1	<.1	10.1
	Bx1	29-32	.12			1.3	1.0	.1	.1	10.8
	Bx2	32-37	.12			1.5	1.2	.1	.1	10.7
	Bx3	37-45	.10			1.6	1.1	.1	.1	9.7
	B31	45-50	.10			2.8	1.5	.1	.1	8.7
	B32	50+	.09			2.9	2.3	.1	.1	8.3
Alvira shaly silt loam: S59Pa.-19-5-(1-8) (¾ mile southwest of Rohrsburg)	Ap	0-10	1.82	.166	11	7.8	.7	.1	.3	7.3
	B21	10-13	.39	.091	4	4.3	1.2	.1	.1	5.1
	B22	13-18	.33	.086	4	6.0	1.0	.1	.1	4.8
	B23	18-22	.18	.076	(1)	5.8	.6	.1	.1	4.9
	Bx1	22-32	.14			1.7	.8	.1	<.1	6.5
	Bx2	32-42	.07			.9	1.1	.1	<.1	6.2
	Bx3	42-51	.07			1.4	1.5	.1	<.1	5.6
	C	51-60	.07			.6	1.4	.1	<.1	5.5
Chenango gravelly sandy loam: S59Pa.-19-16-(1-4) (3 miles east of Bloomsburg)	Ap	0-10	2.06	.147	14	4.2	1.2	.1	.1	7.3
	B2	10-16	.49	.142	3	3.4	.1	.1	<.1	3.6
	B3	16-21	.58	.059	10	3.6	<.1	.1	<.1	2.3
	C	21-48	1.09	.065	17	5.6	<.1	.1	<.1	3.2
Hartleton channery silt loam: S59Pa.-19-4-(1-6) (2 miles northwest of Rohrsburg)	Ap	0-8	1.65	.152	11	8.8	.7	.1	.1	5.7
	B1	8-12	.44	.076	6	6.5	.6	.1	.1	5.9
	B21	12-20	.20	.065	(1)	3.8	.6	.1	<.1	4.9
	B22	20-28	.16			2.3	.8	.1	<.1	4.3
	B3	28-34	.11			2.8	.8	.1	<.1	4.3
	C	34-40	.10			1.4	.8	.1	<.1	4.1

See footnote at end of table.

properties of selected soils—Continued

Fine sand (0.25 to 0.10 mm.)	Very fine sand (0.10 to 0.05 mm.)	Silt (0.05 to 0.002 mm.)	Clay (less than 0.002 mm.)	Bulk density	Moisture held at tension of— ⅓ atmosphere	Moisture held at tension of— 15 atmospheres	Moisture-holding capacity
Percent	*Percent*	*Percent*	*Percent*	*Gm. per cu. cm.*	*Percent*	*Percent*	*Inches per inch*
8.3	9.5	53.5	17.0	1.02	37.8	13.5	0.25
6.2	7.8	53.3	23.1	1.54	23.3	10.7	.19
7.2	8.4	53.7	20.1	1.39	26.4	9.6	.23
7.5	9.1	53.1	17.7	1.43	22.9	8.8	.20
13.4	12.8	35.9	9.1	1.83	10.0	3.7	.12
14.5	12.4	34.1	10.9	1.80	9.4	3.9	.10
14.8	12.9	31.9	12.4	---	---	4.0	---
14.7	12.6	33.4	14.4	---	---	4.3	---
---	---	---	---	---	---	---	---
14.1	48.0	16.2	12.2	1.33	25.6	8.2	.23
13.9	45.5	18.3	5.0	1.54	21.3	8.1	.20
15.9	42.9	14.0	11.8	1.67	19.3	6.4	.22
17.4	41.8	10.0	23.8	1.77	17.1	4.7	.22
19.3	35.6	9.7	30.1	1.71	17.2	3.7	.23
18.9	35.2	10.8	38.0	1.86	10.5	4.0	.12
14.9	36.8	13.9	55.3	1.90	12.2	4.8	---
14.5	35.2	13.4	26.2	---	---	4.6	.14

properties of selected soils

value is not determined]

Cation-exchange capacity (sum)	Base saturation	Reaction field (electrometric)	Mineral composition of clay fraction: Kaolinite (7Å spacing)	Illite (10Å spacing)	Vermiculite (variable spacing)	Montmorillonite (variable spacing)	Chlorite (14Å spacing)	Interstratified (variable spacing)
Meq./100 gm. soil	*Percent*	*pH*						
14.4	69	6.9	15	55	20	---	---	10
10.3	42	5.8	10	60	20	---	---	10
12.0	30	5.2	10	70	15	---	---	5
12.8	21	5.1	10	75	10	---	---	5
13.3	19	5.0	10	65	10	5	---	10
13.6	21	5.2	10	65	10	5	5	5
12.6	23	5.2	10	65	10	---	5	10
13.2	34	5.3	15	60	10	5	---	10
13.7	39	5.3	15	60	10	5	---	10
16.2	55	7.2	10	50	25	---	5	10
10.8	53	6.2	---	---	---	---	---	---
12.0	60	5.8	10	60	15	5	5	5
11.5	57	5.6	---	---	---	---	---	---
9.1	29	5.0	15	65	10	5	---	5
8.3	25	5.0	---	---	---	---	---	---
8.6	35	5.0	15	70	5	5	---	5
7.6	28	4.9	15	70	10	---	---	5
12.9	43	6.2	---	25	15	---	15	45
7.2	50	6.2	---	---	---	---	---	---
6.0	62	6.4	---	25	15	---	15	45
8.9	64	6.4	---	50	15	---	10	25
15.4	63	6.5	15	50	15	---	5	15
13.2	55	6.8	---	---	---	---	---	---
9.4	48	6.6	20	50	20	---	---	10
7.5	43	5.6	---	---	---	---	---	---
8.0	46	5.4	20	60	10	---	---	10
6.4	36	4.9	20	60	5	---	5	10

TABLE 11.—*Chemical properties*

Soil name, sample number, and location	Horizon	Depth	Organic carbon	Nitrogen	Carbon-nitrogen ratio	Extractable cations (milliequivalents per 100 grams of soil) Calcium	Magnesium	Sodium	Potassium	Hydrogen
		Inches	*Percent*	*Percent*						
Hartleton channery silt loam:	Ap	0–9	1.74	.144	12	7.6	0.4	0.1	0.1	6.1
S59Pa.–19–14–(1–5)	B1	9–13	.35	.071	5	4.9	.2	.1	.1	4.0
(2 miles southeast of	B21	13–20	.17	.070	(1)	5.0	.2	.1	.1	4.7
Bloomsburg):	B22	20–26	.17	.073	(1)	3.1	.2	.1	.1	7.4
	B3	26–31	.12			1.9	.3	.1	.1	7.1
Lackawanna channery loam:	Ap	0–8	1.66	.114	15	8.9	.3	.2	.1	4.3
S59Pa.–19–8–(1–9)	A2	8–12	.18	.054	(1)	4.0	1.0	.1	<.1	4.8
(1½ miles northwest of	B1	12–17	.15			2.7	.2	.1	<.1	4.6
Divide)	B21	17–24	.07			2.3	.2	.1	<.1	7.1
	B22	24–32	.07			1.1	.1	.1	<.1	6.7
	B23	32–38	.05			.6	.5	.1	<.1	5.8
	B31	38–45	.06			.4	.1	.1	<.1	5.5
	B32	45–50	.04			.4	.2	.1	<.1	5.7
	C	50–54	.05			.4	.1	.1	<.1	5.0
Lackawanna channery loam:	Ap	0–6	1.82	.156	12	5.5	1.7	.1	.1	7.4
S59Pa.–19–9–(1–8)	A2	6–10	.41	.062	7	2.3	1.0	.1	.1	4.8
(1½ miles east of Coles	B1	10–16	.07			.7	.8	.1	<.1	3.3
Creek)	B21	16–22	.07			.5	.3	.1	<.1	3.6
	B22	22–32	.05			.3	.3	.1	<.1	3.7
	B23	32–44	.05			.3	.1	.1	<.1	4.2
	Bx	44–51	.08			.3	.2	.1	<.1	5.7
	C	51+	.10			.3	.2	.1	<.1	5.3
Lawrenceville silt loam:	Ap	0–8	1.12	.092	12	5.1	<.1	.1	<.1	5.1
S59Pa.–19–11–(1–10)	A2	8–14	.26	.052	5	3.6	<.1	.1	<.1	3.7
(1 mile east of Bloomsburg)	B21	14–19	.21	.045	(1)	4.7	<.1	.1	<.1	2.8
	B22	19–24	.15			3.6	.1	.1	<.1	2.0
	B23	24–30	.11			3.6	<.1	.1	<.1	2.2
	B24	30–35	.11			3.5	.1	.1	<.1	2.3
	Bx1	35–41	.12			3.3	.6	.1	<.1	3.9
	Bx2	41–44	.14			2.9	1.0	.1	<.1	7.5
	Bx3	44–55	.14			2.5	1.2	.1	<.1	7.6
	C	55–64	.12			1.1	.7	.1	<.1	4.0
Lawrenceville silt loam:	Ap	0–9	1.49	.122	12	5.7	.2	.7	.1	7.0
S59Pa.–19–12–(1–11)	A2	9–12	.92	.081	11	3.3	.2	.2	<.1	5.9
(1 mile west of Bloomsburg)	B1	12–17	.37	.053	7	2.4	.2	.2	<.1	4.3
	B21	17–25	.17	.041	(1)	3.2	.1	.2	<.1	3.4
	B22	25–32	.15			2.8	<.1	.1	<.1	4.2
	Bx1	32–36	.13			1.8	<.1	.1	<.1	4.9
	Bx2	36–41	.10			1.8	<.1	.1	<.1	3.3
	Bx3	41–46	.10			2.5	<.1	.1	<.1	4.2
	B31	46–57	.11			2.0	<.1	.1	<.1	4.0
	B32	57–66	.17			2.1	.1	.1	<.1	5.0
	B33	66–72	.11			2.7	.2	.1	<.1	6.9
Leck Kill channery silt loam:	Ap	0–8	1.18	.109	11	5.1	.2	.2	.1	4.5
S59Pa.–19–13–(1–5)	B21	8–15	.30	.062	5	4.6	<.1	.1	<.1	3.2
(3 miles southwest of	B22	15–24	.15	.069		4.6	<.1	.1	<.1	2.7
Catawissa)	B3	24–29	.20			5.6	<.1	.1	<.1	3.6
	C	29–37	.08			2.8	.2	.1	.1	7.6
Leck Kill channery silt loam:	Ap	0–10	2.06	.172	12	11.2	.3	.1	.1	4.4
Sp59Pa.–19–15–(1–5)	B1	10–14	.47	.079	6	6.5	<.1	.1	<.1	3.2
(1 mile east of Mainville)	B21	14–23	.20	.069	(1)	5.9	.2	.1	<.1	2.9
	B22	23–27	.10			5.8	.2	.1	<.1	3.0
	B3	27–32	.09			2.4	.1	.1	<.1	7.2

See footnote at end of table.

of selected soils—Continued

Cation-exchange capacity (sum)	Base saturation	Reaction field (electrometric)	Mineral composition of clay fraction					
			Kaolinite (7Å spacing)	Illite (10Å spacing)	Vermiculite (variable spacing)	Montmorillonite (variable spacing)	Chlorite (14Å spacing)	Interstratified (variable spacing)
Meq./100 gm. soil	*Percent*	*pH*						
14.3	57	6.3	10	55	25	--	--	10
9.3	57	6.3	--	--	--	--	--	--
10.1	53	6.4	15	65	15	--	--	5
10.9	32	5.9	--	--	--	--	--	--
9.5	25	5.0	20	70	10	--	--	--
13.8	69	7.1	20	30	35	--	5	10
9.9	52	6.6	--	--	--	--	--	--
7.6	39	5.1	20	40	25	--	5	10
9.7	27	5.2	--	--	--	--	--	--
8.0	16	5.0	20	50	20	--	5	5
7.0	17	5.0	--	--	--	--	--	--
6.1	10	5.0	15	70	5	--	10	--
6.4	11	5.0	--	--	--	--	--	--
5.6	11	5.0	15	70	5	--	10	5
14.8	50	6.2	5	55	15	--	10	15
8.3	42	6.8	--	--	--	--	--	--
4.9	33	5.2	--	75	10	--	15	--
4.5	20	5.0	--	--	--	--	--	--
4.4	16	5.0	--	80	--	--	20	--
4.7	11	4.9	--	--	--	--	--	--
6.3	10	4.9	--	80	--	--	20	--
5.9	10	4.8	--	--	--	--	--	--
10.3	50	6.2	5	35	15	--	10	35
7.4	50	6.5	--	--	--	--	--	--
7.6	63	6.6	10	45	20	--	10	15
5.8	66	6.5	--	--	--	--	--	--
5.9	63	6.8	15	45	25	5	5	5
6.0	62	6.9	--	--	--	--	--	--
7.9	51	6.4	10	30	35	--	5	20
11.5	35	5.4	--	--	--	--	--	--
11.4	33	5.8	10	30	40	--	5	15
5.9	32	5.4	--	--	--	--	--	--
13.7	49	6.6	--	40		--	15	45
9.6	38	6.4	--	--	--	--	--	--
7.1	39	6.4	--	50	25	--	15	10
6.9	51	6.4	--	--	--	--	--	--
7.1	41	5.2	--	60	20	--	15	5
6.8	28	5.1	--	--	--	--	--	--
5.2	36	5.2	--	65	15	--	15	5
6.8	38	5.2	--	--	--	--	--	--
6.1	34	5.0	--	75	10	--	10	5
7.3	32	5.0	--	--	--	--	--	--
9.9	30	5.0	15	45	30	--	5	5
10.1	55	6.2	10	55	15	--	10	10
7.9	59	6.6	--	--	--	--	--	--
7.4	64	6.8	15	50	25	--	10	--
9.3	61	6.8	--	--	--	--	--	--
10.8	30	6.7	20	50	20	--	5	5
16.1	73	6.8	10	60	10	--	5	15
9.8	67	7.2	--	--	--	--	--	--
9.1	68	7.3	10	65	5	--	10	10
9.1	67	7.2	--	--	--	--	--	--
9.8	26	5.9	10	70	5	--	10	5

TABLE 11.—*Chemical properties*

Soil name, sample number, and location	Horizon	Depth	Organic carbon	Nitrogen	Carbon-nitrogen ratio	Extractable cations (milliequivalents per 100 grams of soil): Calcium	Magnesium	Sodium	Potassium	Hydrogen
		Inches	*Percent*	*Percent*						
Shelmadine silt loam: S59Pa.-19-2-(1-8) (2 miles southwest of Rohrsburg)	Ap	0-8	1.79	.178	10	2.0	0.4	0.1	0.1	13.6
	B1	8-11	1.39	.151	9	2.3	.6	<.1	.1	13.7
	B21	11-15	.64	.113	6	2.5	.8	.1	.1	14.7
	B22	15-22	.36	.081	4	2.1	1.3	.1	.1	14.3
	B23	22-32	.28	.072	4	1.3	1.6	.1	.1	12.2
	Bx1	32-36	.24	.068	([1])	.7	1.7	.1	.1	10.0
	Bx2	36-42	.18	.062	([1])	.4	1.4	.1	<.1	6.5
	C	42-50	.18	.075	([1])	.5	1.3	<.1	<.1	6.5
Shelmadine silt loam: S59Pa.-19-6-(1-9) (¾ mile southwest of Rohrsburg)	Ap	0-9	1.49	.135	11	5.5	1.9	.1	.1	10.0
	A2g	9-11	.61	.091	7	3.2	1.1	.1	.1	9.2
	B1g	11-16	.30	.067	5	3.1	.5	.1	.1	8.2
	B21g	16-23	.21	.054	([1])	2.7	.5	.1	.1	8.7
	B22	23-31	.21	.045	([1])	.5	1.2	.1	<.1	7.0
	Bx1	31-39	.18	.038	([1])	.4	.9	.1	<.1	4.9
	Bx2	39-42	.13	---	---	.8	1.3	.1	<.1	4.7
	IIC1	42-47	.05	---	---	.9	.8	.1	<.1	3.6
	IIC2	47-58	.03	---	---	1.1	.7	.1	.1	2.4
Watson silt loam: S59Pa.-19-7-(1-8) (½ mile southwest of Rohrsburg)	Ap	0-8	1.94	.155	13	7.8	1.5	.1	.1	7.7
	B1	8-13	.68	.070	10	4.5	1.2	.1	.1	6.0
	B21	13-18	.47	.074	6	5.7	.3	.1	.1	5.6
	B22	18-24	.28	.065	4	2.8	.6	.1	<.1	6.2
	Bx1	24-35	.20	.061	([1])	2.7	.4	.1	<.1	6.6
	Bx2	35-43	.13	---	---	1.5	.4	.1	<.1	7.0
	Bx3	43-52	.13	---	---	1.7	.4	.1	.1	6.6
	C	52-60	.10	---	---	1.9	.6	.1	<.1	7.4
Watson silt loam: S60Pa.-19-18-(1-11) (1 mile east of Millville)	Ap1	0-5	2.29	.225	10	1.4	.6	.1	.2	14.8
	Ap2	5-11	1.27	.146	9	.3	.4	.1	.2	12.7
	B1	11-16	.41	.113	4	.1	.5	.1	.2	8.4
	B2	16-23	.18	---	---	.2	.9	.1	.1	9.5
	Bx1	23-31	.10	---	---	.1	1.1	.1	.1	6.4
	Bx2	31-38	.06	---	---	.3	1.6	.1	.1	6.7
	Bx3	38-46	.08	---	---	.2	1.8	.1	.1	6.9
	Bx4	46-54	.05	---	---	.1	2.4	.1	.1	7.4
	Bx5	54-61	.08	---	---	.1	2.1	.1	.2	5.3
	C1	61-69	.05	---	---	.1	2.4	.1	.2	4.9
	C2	69-72	.14	---	---	.3	2.5	.2	.1	4.7
Wellsboro channery silt loam: S60Pa.-19-20-(1-9) (2 miles east of Central)	Ap	0-7	2.34	.228	10	2.2	.5	.1	.2	17.1
	B21	7-12	.46	.073	6	1.2	.4	.1	.2	13.3
	B22	12-17	.31	.065	5	1.4	.6	<.1	.2	10.4
	B23	17-24	.30	.060	5	1.1	.6	.1	.2	10.2
	IIB24	24-32	.44	.039	11	.3	.4	<.1	.1	5.9
	IIB25	32-40	.01	---	---	.8	.7	<.1	.1	4.3
	IIBx1	40-48	.01	---	---	1.9	1.0	.1	.3	2.2
	IIBx2	48-50	.06	---	---	1.7	1.1	.1	.1	3.4
	R	50+	---	---	---	---	---	---	---	---
Wellsboro silt loam: S60Pa.-19-19-(1-8) (1½ miles southeast of Central)	Ap	0-7	1.88	.164	11.5	4.5	2.0	.1	.2	5.0
	B1	7-11	.39	.066	5.9	2.7	.9	.1	.1	4.0
	B21	11-18	.11	---		1.2	.5	.1	.1	3.8
	B22	18-22	.03	---	---	.8	.4	.1	.1	3.3
	B23	22-31	.02	---	---	.3	.3	.1	.1	3.1
	Bx1	31-42	.01	---	---	.3	.3	.1	.1	4.4
	Bx2	42-52	.03		---	.2	.5	.1	.1	4.4
	Bx3	52-63	.01	---	---	.2	.3	.2	.1	4.6

[1] Values considered not representative of the natural soil or were based on numerical results too low for meaningful interpretations.

of selected soils—Continued

Cation-exchange capacity (sum)	Base saturation	Reaction field (electrometric)	Mineral composition of clay fraction					
			Kaolinite (7Å spacing)	Illite (10Å spacing)	Vermiculite (variable spacing)	Montmorillonite (variable spacing)	Chlorite (14Å spacing)	Interstratified (variable spacing)
Meq./100 gm. soil	*Percent*	*pH*						
16. 2	16	5. 4	10	45	35	---	---	10
16. 7	18	5. 2	---	---	---	---	---	---
18. 2	19	5. 0	10	45	35	---	5	5
17. 9	20	5. 0	---	---	---	---	---	---
15. 3	20	5. 1	10	60	10	10	5	5
12. 6	21	4. 9	---	---	---	---	---	---
8. 8	23	5. 0	10	65	10	5	5	5
8. 3	22	5. 0	---	---	---	---	---	---
17. 6	43	5. 2	25	25	40	---	---	10
13. 7	33	5. 0	---	---	---	---	---	---
12. 0	32	4. 8	20	40	25	5	5	5
12. 1	28	5. 0	---	---	---	---	---	---
8. 8	20	5. 2	15	50	20	10	---	5
6. 3	22	5. 2	---	---	---	---	---	---
6. 9	32	5. 3	20	45	25	5	---	5
5. 4	33	5. 4	---	---	---	---	---	---
4. 4	45	5. 7	20	65	5	---	---	10
17. 2	55	6. 3	20	35	30	---	5	10
11. 9	50	6. 5	---	---	---	---	---	---
11. 8	52	6. 3	20	40	30	---	---	10
9. 7	36	5. 5	---	---	---	---	---	---
9. 8	33	5. 2	30	35	30	---	---	5
9. 0	22	5. 0	---	---	---	---	---	---
8. 9	26	5. 0	25	50	20	---	---	5
10. 0	26	4. 9	25	45	25	---	---	5
17. 1	13	4. 9	5	65	20	---	5	5
13. 7	7	4. 8	---	---			---	---
9. 3	10	5. 0	5	70	25	---	---	---
10. 8	12	4. 9	---	---	---	---	---	---
7. 8	18	5. 1	5	85	5	5	---	---
8. 8	24	5. 2	---	---	---	---	---	---
9. 1	24	5. 6	5	85	5	5	---	---
10. 1	27	5. 8	---	---	---	---	---	---
7. 8	32	5. 7	5	85	10	---	---	---
7. 7	36	5. 6	---	---	---	---	---	---
7. 8	40	5. 6	5	85	5	5	---	---
20. 1	15	5. 3	---	30	50	---	10	10
15. 2	13	5. 3	---	---	---	---	---	---
12. 6	17	5. 3	---	50	25	5	10	10
12. 2	16	5. 3	---	---	---	---	---	---
6. 7	12	5. 1	---	70	5	5	15	5
5. 9	27	5. 3	---	---	---	---	---	---
5. 5	60	5. 6	---	80	---	---	20	---
6. 4	47	5. 7	---	---	---	---	---	---
---	---	---	---	---	---	---	---	---
11. 8	65	6. 4	---	35	10	---	15	40
7. 8	39	5. 6	---	---	---	---	---	---
5. 7	26	5. 1	---	45	30	5	15	5
4. 7	21	5. 1	---	---	---	---	---	---
3. 9	22	4. 8	---	80	---	---	20	---
5. 2	18	4. 6	---	---	---	---	---	---
5. 3	17	4. 6	---	---	---	---	---	---
5. 4	17	4. 6	---	80	---	---	20	---

eral. Although combinations of two clay minerals are most common, three or four different clay minerals can be interlayered.

Soil genesis interpretations

To facilitate the interpretation of the clay mineral information in terms of soil genesis it has been found helpful to define a "standard" soil profile with respect to the distribution of clay mineral types as a function of depth. This standard soil profile is assumed to be representative of many soils in Pennsylvania. The standard profile has the typical distribution of clay mineral we would expect to find in a mature, well-drained soil derived from sedimentary rocks in Pennsylvania. It has a medium-textured surface soil and a finer textured subsoil. Soil genesis interpretations can be made by comparing this standard profile with the one being examined.

Sedimentary rocks, having formed from material subjected to one or more cycles of weathering, already contain a suite of clay minerals, and this is inherited by the soil that forms in material derived from these rocks. Typical mineral suites are composed of some combination of illite, kaolinite, and trioctahedral chlorite. In some cases the parent rock contains a high predominance of illite but only small amounts of other clay minerals.

In the standard profile, illite is the dominant clay type. Within the profile, the illite is most abundant in the C horizon and progressively decreases in amount with approach to the surface. Kaolinite is present in a lesser amount than illite and is distributed fairly uniformly throughout the profile. Dioctahedral chlorite generally occurs interstratified with vermiculite and is most prominent in the surface horizons. Trioctahedral chlorite, when present, usually is most abundant in the B and C horizons.

In our standard soil, which is well drained and in a humid temperate climate, dominant movement of water is down through the profile. This downward movement leads to weathering, leaching, and translocation of material within the profile. Consequently, at maturity, this profile has a characteristic distribution of clay minerals that is a function of depth. The weathering process can be conveniently summarized by listing minerals in the order in which they are formed, the adjacent pairs of minerals being regarded as parent mineral and weathering product respectively. The sequence best typifying the process in Pennsylvania is this: Illite–dioctahedral vermiculite (and/or montmorillonite)–dioctahedral chlorite.

Interstratification of clay types may be viewed as a consequence of weathering, the transformation of clay within a single particle being more rapid in some layers than in others. Where the transformation is not completed, the products are intermediate between the steps in the previously mentioned illite–vermiculite–chlorite process. It is therefore common to find illite/vermiculite, and vermiculite/chlorite, as interstratified pairs.

The processes just described result in a distribution of clay types that is typical, or standard, for Pennsylvania. This standard profile is then used as a sort of "yardstick" to evaluate divergence in terms of the factors of soil formation or in related parameters.

Clay minerals in the modal profiles

All of the soils that were sampled for laboratory characterization formed from glacial till and outwash or from loess. The rocks underlying the surface are predominantly of Devonian age. The principal rocks are Catskill red sandstone and shale of upper Devonian age and marine beds of middle Devonian age. The rocks of the middle Devonian age include the Chemung formation and consist of shale and some sandstone. In all the soils sampled, the dominant clay mineral is illite.

On the basis of clay minerals other than illite, the soils can be divided into two groups. In one group the soils characteristically contain a somewhat poorly crystallized kaolinite and randomly interstratified vermiculite and chlorite in a ratio of aproximately 1 to 1. With some exceptions, the profile of the Alvira, Hartleton, Shelmadine, and Watson soils are of this kind. Exceptions are profiles S59Pa.–19–2–(1–8). (Shelmadine), S59Pa.–19–4–(1–6) (Hartleton), and S60Pa.–19–18–(1–11) (Watson). These profiles contain little or no vermiculite and chlorite. In profile S59Pa.–19–10–(1–9) (Alvira), the kaolinite is better crystallized than it is in the other profiles. In all of the soils in this group, the similarities of the clay minerals are probably related to the similarities in the parent rock. This group of soils was derived from pre-Wisconsin glacial till that contained primarily rocks from the Chemung formation or from other Devonian marine beds.

The second group of soils contain trioctahedral chlorite. In this group are soils of the Chenango, Lackawanna, Lawrenceville, Leck Kill, and Wellsboro series. Catskill red sandstone and shale of Devonian age are the parent rocks of the Leck Kill, Lackawanna, and Wellsboro soils.

Montmorillonite, which is associated with poor drainage, is in the subsoil of the Alvira, Shelmadine, Watson, and Wellsboro soils. Of these soils, the Shelmadine contains the most montmorillonite and is the most poorly drained.

The mineral composition of the clay fractions in the selected horizons of the soils sampled is given in table 11. Discussed in the following paragraphs are the distribution of the clay minerals in each soil examined and the significance of this distribution in its relation to soil genesis.

Alvira Shaly Silt Loam

S59Pa.–19–5–(1–8) and S59Pa.–19–10(1–9)

The profiles of this soil contain a similar group of clay mineral types, but there is some difference in the distribution of the clay. Normal weathering is indicated in profile S59Pa.–19–5–(1–8) by a distribution of clay that correlates with the distribution in the standard profile. In the upper four horizons of profile S59Pa.–19–10–(1–9), the distribution of clay minerals is typical but the kinds and amounts of clay minerals are very similar in each of the lower horizons. The content of illite is less in the lower horizons than in the B22 horizon. The intensity of weathering in the lower horizons may have been less than that in the upper four horizons, or the parent material of the upper and the lower horizons may be different as a result of deposition.

Chenango Gravelly Sandy Loam

S59Pa.–19–16–(1–4)

In this profile of Chenango gravelly sandy loam, the distribution of clay minerals is normal. The content of illite is highest in the C horizon, and the amount of vermiculite and interstratified vermiculite and chlorite is greatest in the Ap horizon. The two distinct features that distinguish this soil from the other soils sampled in the county are the very high content of the 14Å component (vermiculite and vermiculite and chlorite) in the upper horizons and the abrupt, instead of gradual, increase of illite in the subsoil. Many of the coarse-textured (sandy) soils in Pennsylvania have a high content of a 14Å component. If this high content is a genetic characteristic of sandy soils, it is probably the result of the high permeability and low clay content permitting the intense leaching of a relatively small volume of clay.

Hartleton Channery Silt Loam

S59Pa. 19-4–(1–6) and S59Pa.–19–14–(1–5)

Because the profiles of this soil show no deviations from the standard profile, the processes of soil development are considered typical.

Lackawanna Channery Loam

S59Pa.19–8–(1–9) and S59Pa.–19–9–(1–8)

The profiles of this soil show that both of them have weathered normally but that the two profiles differ in the kinds of clay minerals they contain. In S59Pa.–19–8–(1–9) a considerable amount of kaolinite occurs throughout, but the amount of trioctahedral chlorite is small. In profile S59Pa.–19–9–(1–8) little or no kaolinite occurs, but the content of chlorite is much more than that in profile S59Pa.–19–8–(1–9). Particularly in the lower horizons, these differences are probably the result of mineralogical differences in the parent rock.

Lawrenceville Silt Loam

S59Pa.–19–11–(1–10) and S59Pa.–19–12–(1–11)

These profiles of this soil show that their distribution of clay differs markedly from the distribution in the standard profile. The clay composition in the lower horizons of profile S59Pa.–19–11–(1–10) and in the bottom horizon of profile S59Pa.–19–12–(1–11) is typical of that in the A horizon of the standard profile. In these samples, the relative distribution of clay minerals in the intermediate horizons is similar to that in the standard profile. The data may be interpreted as the formation of a profile on a preexisting profile, or as a change in the source area for the material above and the material below the line of discontinuity, assuming that both soils have a relatively high content of a 14Å component throughout. Such a content indicates that the source of the material comprising the entire solum is similar to the source of the material in the A horizon. This similar source of material substantiates the belief that the soil material is of eolian origin. Weathering subsequent to deposition has begun to distribute the clay minerals typically in the upper part of the profiles.

Profile S59Pa.–19–11–(1–10) contains less illite and a larger amount of a 14Å component than profile S59Pa.–19–12–(1–11). In profile S59Pa.–19–11–(1–10) kaolinite occurs in all of the horizons, but in profile S59Pa.–19–12–(1–11), it occurs only in the lowest horizon. In profile S59Pa.–19–12–(1–11), the discontinuity at the base of the profile is more abrupt than that in the other profile. This is shown by the presence of kaolinite in the lowest horizon and its absence in the other horizons.

Leck Kill Channery Silt Loam

S59Pa.–19–13–(1–5) and S59Pa.–19–15–(1–5)

Both profiles of this soil show little difference in clay mineralogy among horizons. With respect to weathering, this soil is immature. Erosion may be proceeding rapidly enough to prevent the development of a maturely weathered profile. The clay mineralogy is probably related to the shallowness of the solum and to the loss of clay minerals through erosion.

Shelmadine Silt Loam

S59Pa.–19–2–(1–8) and S59Pa.–19–6–(1–9)

These profiles of this soil show that the distribution of clay minerals in this soil is similar to that in the standard profile. This distribution indicates that a well-developed profile has formed as a result of weathering. Both profiles of this soil contain montmorillonite in the subsoil, which indicates that the loss of bases has been slowed because of poor drainage.

Watson Silt Loam

S59Pa.–19–7–(1–8) and S60Pa.–19–18–(1–11)

These samples of this soil show that the relative distribution of clay minerals in both profiles is similar to the distribution in the standard profile. Profile S60Pa.–19–18–(1–11) has a very high content of illite, considerably more than that of the other profile. Profile S59Pa.–19–7–(1–8) contains twice as much kaolinite as profile S60Pa.–19–18–(1–11), as well as more vermiculite and interstratified vermiculite and chlorite. Since both profiles were derived from the Chemung formation, variations in the mineralogy of this formation probably contributed to the differences in the two profiles.

Wellsboro Channery Silt Loam

S60Pa.–19–20–(1–9) and S60Pa.–19–19–(1–8)

The tested samples of this soil show that the profiles are typical in respect to weathering. A feature of this soil similar to that of its catenary associate Lackawanna silt loam is the large increase of illite in the subsoil and a prominent trioctahedral component. Although the Wellsboro soil and the Lackawanna soil formed from Wisconsin glacial till, their profiles are as fully developed in respect to the distribution of the clay as are the soils that developed from the pre-Wisconsin glacial till.

Additional Facts About the County

In this section climate, geology, physiography, land use, and other subjects of general interest are described. Unless otherwise stated, the statistics in this section are from reports published by the U. S. Bureau of Census.

Climate [7]

The climate of Columbia County is humid and continental. Summers are warm and humid, and the long cold winters have frequent periods of stormy weather. Precipitation is fairly evenly distributed throughout the year but there is slightly more in spring and summer than in fall and winter. In this county, the ranges in extremes of temperature and in seasonal precipitation are not so great as they are in the central part of the United States. The prevailing winds are from the west and northwest.

The weather in Columbia County is variable. During winter and spring, changes occur almost daily, but during summer and fall such changes are less frequent. At times, mostly from June or July through October, the weather changes little for periods of a week or more. In summer during these periods, days are hot and humid, and nights are mild; in fall days are dry and balmy, and nights are cool. One or more periods of hot weather can be expected each year, though in some summers excessive heat does not occur. From December through February, cold spells that last from 5 to 10 days are fairly frequent. Many times during the coldest periods, temperatures are below 20° F. and brisk, northwesterly winds prevail.

Local variations in climate are caused by differences in elevation of as much as 1,000 feet within fairly short distances, and by corresponding differences in slope. In the valleys average temperatures are slightly higher than those at higher elevations, and precipitation is somewhat less. Minimum temperature, however, averages several degrees lower in the relatively narrow valleys than on the adjacent hillsides because cold air is heavier than warm air and drains into the valleys. In the valleys, therefore, temperatures are freezing later in spring and earlier in fall, and the growing season is somewhat shorter. In the valley of the Susquehanna River, however, the flow of air is not restricted, and the length of the growing season is comparable to that in the southern part of the State.

The climatic details discussed in the following paragraphs and the data given in tables 12 and 13 are from records kept at the weather station at Berwick, which is at an elevation of 570 feet.

Temperature

The average annual temperature is several degrees lower in the northern and southern parts of the county than it is in the valley of the Susquehanna River. In the valley, the monthly average temperature ranges from 29° in January to 74° in July. The temperatures generally remain between 10° and 90°, but extremes of —20° in January and 102° in June have been recorded at Berwick, which is in the valley.

In Columbia County the changes in temperature are quite noticeable from day to day. Daily variations are normally 15° to 20° in winter and about 25° in summer. Pronounced changes in temperature within a short period are rare, but at times in winter and early in spring rapidly moving cold air causes a drop in temperature of 30° to 40° or more within 12 hours or less. In summer a drop in temperature of 20° to 30° in 5 to 10 minutes may occur during thunderstorms in the afternoon and at night. Noticeable warming trends are considerably more gradual.

The interval between the last temperature of 32° in spring and the first in fall is generally called the growing season. In the Susquehanna Valley, the average growing season extends from May 1 to October 9, or 161 days. In other parts of the county the growing season is somewhat shorter. At Berwick the shortest

[7] By NELSON M. KAUFFMAN, State climatologist, U.S. Weather Bureau.

TABLE 12.—*Temperature and precipitation at Berwick, Pa., 1946–1963*

Month	Temperature				Precipitation					
	Average daily maximum	Average daily minimum	Average maximum	Average minimum	Average total	One year in 10 will have— Less than—	One year in 10 will have— More than—	Snow: Average total	Snow: Average number of days with depth of— 1 inch	Snow: Average number of days with depth of— 6 inches
	°F.	*°F.*	*°F.*	*°F.*	*Inches*	*Inches*	*Inches*	*Inches*		
January	37	21	55	1	2.5	0.9	3.5	6.7	10	2
February	40	22	58	—1	2.4	1.2	3.7	6.7	9	3
March	49	28	67	11	2.9	1.5	3.9	4.6	4	1
April	63	39	84	24	3.6	.9	5.5	4.4	(1)	0
May	74	48	88	32	4.2	1.9	7.1	0	0	0
June	81	57	94	43	3.5	1.1	5.5	0	0	0
July	86	61	95	50	4.6	2.3	9.7	0	0	0
August	84	60	94	46	4.2	1.9	7.1	0	0	0
September	77	53	91	35	3.1	1.7	5.4	0	0	0
October	68	43	83	28	2.9	.9	5.0	0	0	0
November	52	33	70	18	3.2	1.3	5.6	1.4	1	(1)
December	39	22	58	1	2.8	1.1	4.4	7.2	10	2
Annual	63	41	[2] 102	[3] —20	39.9	34.9	45.2	31.0	34	8

[1] Less than 0.5 day.
[2] Highest maximum between 1946 and 1963.
[3] Lowest minimum between 1946 and 1963.

TABLE 13.—*Probabilities of the last freezing temperatures in spring and the first in fall at Berwick*

Probability	Dates for given probability at temperature of—				
	16° F. or lower	20° F. or lower	24° F. or lower	28° F. or lower	32° F. or lower
Spring:					
1 year in 10 later than	March 28	April 8	April 15	May 3	May 16
2 years in 10 later than	March 22	April 2	April 10	April 28	May 11
5 years in 10 later than	March 11	March 23	March 31	April 19	May 1
Fall:					
1 year in 10 earlier than	November 22	November 2	October 30	October 7	September 25
2 years in 10 earlier than	November 26	November 7	November 4	October 12	September 30
5 years in 10 earlier than	December 4	November 17	November 12	October 22	October 9

growing season on record was 118 days; the longest was 197 days. Table 13 gives probabilities of the last temperatures of as low as 16°, 20°, 24°, 28°, and 32° in spring and the first in fall at Berwick. The information in table 13 can be applied in other parts of the Susquehanna Valley in Columbia County. At higher elevations, a freezing temperature is likely to occur later in spring and earlier in fall than is shown in table 13.

Precipitation

The average precipitation in different parts of Columbia County varies, but the water supply throughout the county is generally adequate for farm, industrial, and home use. The annual precipitation normally ranges from 37 to 40 inches in the Susquehanna Valley to about 45 inches in the southern and northern parts of the county. About 58 percent of the annual rainfall occurs from April through September. The total rainfall for this period normally is slightly more than 23 inches in the Susquehanna Valley, but it ranges from less than 15 inches to 32 inches or more. The differences in the total precipitation for July, the wettest month, and February, the driest month, are generally only slightly more than 3 inches. Variations, however, are considerable from month to month and from year to year in a given month. At Berwick, a total monthly rainfall has been as much as 13 inches in August and 0.25 inch in October. Summer rains do not last long and usually are in the form of local showers and thunderstorms. Extended droughts are not common, but an occasional dry spell may affect the entire county.

Snowfalls are frequent and sometimes heavy from December through March. In March heavy wet snow may damage trees, utility lines, and other exposed objects. At Berwick monthly totals of 13 to 23 inches are fairly common from December through March. The annual snowfall averages a little more than 30 inches in the Susquehanna Valley and 45 inches or more at higher elevations. At Berwick annual snowfall ranges from as little as 13 inches to 45 inches or more. In the Susquehanna Valley, the ground normally remains covered with snow for about one-fourth of the winter, but at higher elevations the ground is covered most of the winter. Because the water content of the snow on the ground may amount to 2 or 3 inches or more, the stream valleys are likely to be flooded when the snow melts in the spring, particularly if the melting of the snow is accompanied by heavy rainfall.

Storms

Thunderstorms, the most frequent and damaging storms in the county, may occur in any month of the year, but they are most frequent from May through September. The heavy rains that accompany the more severe storms damage tender plants and cause soil erosion. In a few local areas damage by hail may be extensive. Some winds have gusts of as much as 60 miles per hour. From July through October, remnants of hurricanes occasionally pass near enough to the county for rains to be heavy and winds to be damaging.

Geology, Physiography, Drainage, and Water Supply

Columbia County extends from the edge of the Allegheny Plateau in the north to the coal beds in the south. The Pottsville formation is the highest geologic formation in the county. It belongs to the Pennsylvanian system and consists of sandstone. Underlying the Pottsville formation are the red beds of the Mauch Chunk formation and sandstone of the Pocono formation. The Mauch Chunk and Pocono formations belong to the Mississippian system. They are underlain by formations that belong to the Devonian system. These formations are the Catskill and Chemung, which are shale and sandstone; the Oriskany, which is sandstone; the Helderberg, which is limestone; and the Portage and Marcellus, which are shale. The lowest formations in the county belong to the Silurian system. These formations are Bloomsburg red beds of the Cayuga group and the Clinton formation, which is shale and sandstone.

The principal mountain ridges cross Columbia County from east to west, approximately paralleling the Susquehanna River. The average elevation of the ridges is about 1,800 feet, but one peak has an elevation of more than 2,250 feet. The principal valleys average about 700 feet above sea level, but the flood plains along the Susquehanna River are less than 500 feet above.

The topography of the county is one of rolling hills, valleys, and interspersed steep mountains. Along the

Susquehanna River and Fishing Creek are broad, smooth, gently sloping terraces and nearly level flood plains.

This county is drained by the Susquehanna River and several of its tributaries. Roaring Creek and Catawissa Creek drain the southern part of the county. Most of the county north of the river is drained by Fishing Creek, Little Fishing Creek, Briar Creek, and their tributaries.

Springs and drilled wells are the main sources of water on farms and in small communities. Most of the water is soft, but a few wells have hard water. The larger communities have filtration plants and draw water from Briar Creek, Fishing Creek, Little Fishing Creek, and other streams. During long dry periods water is pumped from the Susquehanna River.

History, Organization, and Population

The earliest known inhabitants of the area that is now Columbia County were the Lenni Lenape Indians. A branch of this tribe settled along the Susquehanna River and were known as the Susquehannocks, but they were later driven out by the Iroquois Indians.

The area was opened to settlement in 1754. Settlers from Connecticut moved into the area that is now Fishing Creek Township. Many of the early settlers were Irish, Dutch, Welsh, German, and Scotch-Irish. They settled in the areas near the present towns of Bloomsburg, Millville, Berwick, Mifflinville, and Orangeville. Later, Slavic immigrants came to work the coalfields in Conyngham Township.

In 1813, Columbia County was formed from what was then known as Northumberland County. It included the area consisting of what is now Columbia and Montour Counties and part of Schuylkill County. Later Montour and Schuylkill were formed into separate counties.

According to the 1960 census, the population of Columbia County was 53,489. Bloomsburg, the county seat, had a population of 10,655 in 1960, and Berwick has a population of 13,353.

Transportation and Markets

Railroads parallel the Susquehanna River, Fishing Creek, and Catawissa Creek, but their use has declined in recent years. Improved roads cross the county in all directions. The main highways are Interstate Highway No. 80, U.S. Highway No. 11, and State Route 118. The largest local market is in the area of Wilkes-Barre and Scranton, but trucks also transport crops to Harrisburg, Philadelphia, and New York.

Land Use, Crops, and Livestock

In 1959 the farmland in Columbia County was 170,068 acres. There were 1,531 farms in the county at that time. The average-sized farm had 111.1 acres.

The acreage of the principal crops and the amount of apples and peaches produced in Columbia County in 1959 were as follows:

Corn for grain	17,753 acres
Corn for silage	2,346 acres
Wheat	13,196 acres
Oats	15,667 acres
Hay	22,238 acres
Potatoes (Irish)	893 acres
Vegetables (sweet corn, peas, tomatoes)	1,934 acres
Apples	61,985 bushels
Peaches	28,676 bushels

In 1959 there were 16,799 cattle and calves on farms, and 7,484 of these were milk cows. Other livestock on farms included 14,513 hogs and pigs. The number of chickens sold, including broilers, amounted to 1,096,705.

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Glossary

Alluvial soil. Soil formed from material, such as gravel, sand, silt, or clay, that has been deposited by streams and that shows little or no modification by soil-forming processes.

Available moisture capacity. The capacity of a soil to hold water in a form available to plants. The difference between the amount of moisture held in a soil at field capacity and the amount in the same soil at permanent wilting point. Commonly expressed as inches of water per inch of soil.

Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

Catena. A sequence, or "chain," of soils on a landscape, developed from one kind of parent material but having different characteristics because of differences in relief and drainage.

Channery soil. A soil that contains thin, flat fragments of sandstone, limestone, or schist, as much as 6 inches in length along the longer axis. A single piece is called a fragment.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of clay on the surface of a soil aggregate. Synonyms: clay coat, clay skin.

Cobble (cobblestone). A rounded or partly rounded fragment of rock, 3 to 10 inches in diameter.

Conglomerate. Rock composed of gravel and rounded stones cemented together by hardened clay, lime, iron oxide, or silica.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose. Noncoherent; soil does not hold together in a mass.

Friable. When moist, soil crushes under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm. When moist, soil crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic. When wet, soil is readily deformed by moderate pressure but can be pressed into a lump; forms a wire when rolled between thumb and forefinger.

Sticky. When wet, soil adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

Hard. When dry, soil is moderately resistant to pressure and is difficult to break between the thumb and forefinger.

Soft. When dry, soil breaks into powder or individual grains under very slight pressure.

Cemented. Hard and brittle; little affected by moistening.

Cover crop. A close-growing crop grown primarily to improve the soil and to protect it between periods of regular crop production; or a crop grown between trees and vines in orchards and vineyards.

Flood plain. Nearly level land, consisting of stream sediment, that borders a stream and is subject to flooding unless protected artificially.

Glacial drift. Rock material transported by glacial ice and then deposited; also includes the assorted and unassorted materials deposited by streams flowing from glaciers.

Glacial outwash. Cross-bedded gravel, sand, and silt deposited by melt water as it flowed from glacial ice.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes and that differs in one or more ways from adjacent horizons in the same profile.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Mottled. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: Abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are these: *fine,* less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium,* ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse,* more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Ped. An individual natural soil aggregate, such as a crumb, a prism, or a block, in contrast to a clod.

Permeability, soil. The quality of a soil horizon that enables water or air to move through it. Terms used to describe permeability are as follows: *Very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

pH. See Reaction.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material. See Horizon, soil.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values and in words, as is follows:

	pH		*pH*
Extremely acid	Below 4.5	Moderately alkaline	7.9 to 8.4
Very strongly acid	4.5 to 5.0	Strongly alkaline	8.5 to 9.0
Strongly acid	5.1 to 5.5	Very strongly alkaline	9.1 and higher
Medium acid	5.6 to 6.0		
Slightly acid	6.1 to 6.5		
Neutral	6.6 to 7.3		
Mildly alkaline	7.4 to 7.8		

Sand. As a soil separate, individual rock or mineral fragments 0.05 to 2.0 millimeters in diameter. Most sand grains consist of quartz, but they may be of any mineral composition. As a textural class, soil that is 85 percent or more sand and not more than 10 percent clay.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis or aggregates longer than horizontal), *columnar* (prisms with rounded tops), *angular blocky* (prisms with sharp corners), *subangular blocky* (prisms with mostly rounded corners), *granular* (granules relatively nonporous), *crumb* (similar to granular but very porous). *Structureless* soils are (1) *single grain* (each grain by itself, as in dune sand) or (2) *massive* (the particles adhering without any regular cleavage, as in many claypans and hardpans).

Substratum. Any layer lying beneath the solum, or true soil; the C or R horizon.

Texture soil. The relative proportion of sand, silt, and clay particles in a mass of soil (see also Clay, Sand, and Silt). The basic texture classes, in order of increasing proportions of fine particles are: *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Till (glacial). Unassorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Weathering. All physical and chemical changes produced in rock at or near the earth's surface by atmospheric agents. These changes result in more or less complete disintegration and decomposition of the rock.

Accessibility Statement

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U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

PENNSYLVANIA STATE UNIVERSITY
COLLEGE OF AGRICULTURE
AGRICULTURAL EXPERIMENT STATION

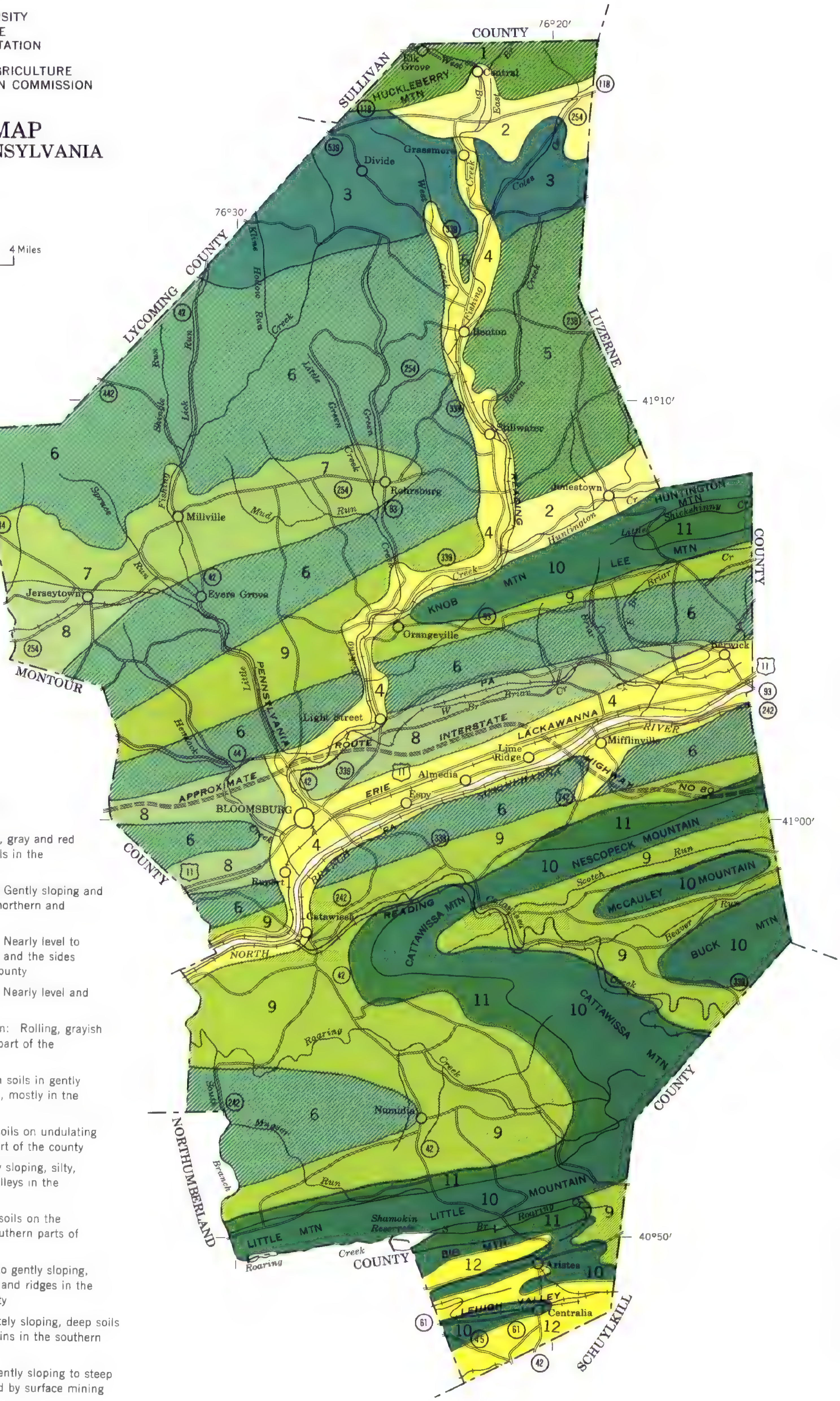
PENNSYLVANIA DEPARTMENT OF AGRICULTURE
STATE SOIL AND WATER CONSERVATION COMMISSION

GENERAL SOIL MAP
COLUMBIA COUNTY, PENNSYLVANIA

Scale 1:190,080

1 0 1 2 3 4 Miles

N



SOIL ASSOCIATIONS

1 Lordstown-Oquaga association: Steep, gray and red stony soils of the ridges and valley walls in the extreme northern part of the county

2 Wellsboro-Morris-Oquaga association: Gently sloping and nearly level soils in reddish till in the northern and central parts of the county

3 Oquaga-Wellsboro-Morris association: Nearly level to steep soils in reddish till on low ridges and the sides of valleys in the northern part of the county

4 Chenango-Barbour-Pekin association: Nearly level and level soils on terraces and flood plains

5 Wooster-Ravenna-Lordstown association: Rolling, grayish soils in glacial till in the northeastern part of the county

6 Weikert-Hartleton association: Grayish soils in gently rolling to hilly areas underlain by shale, mostly in the central part of the county

7 Berks-Watson association: Brownish soils on undulating and rolling hills in the northwestern part of the county

8 Westmoreland-Litz association: Gently sloping, silty, loamy soils over calcareous rocks in valleys in the central part of the county

9 Klinesville-Leck Kill association: Red soils on the rolling shale hills in the central and southern parts of the county

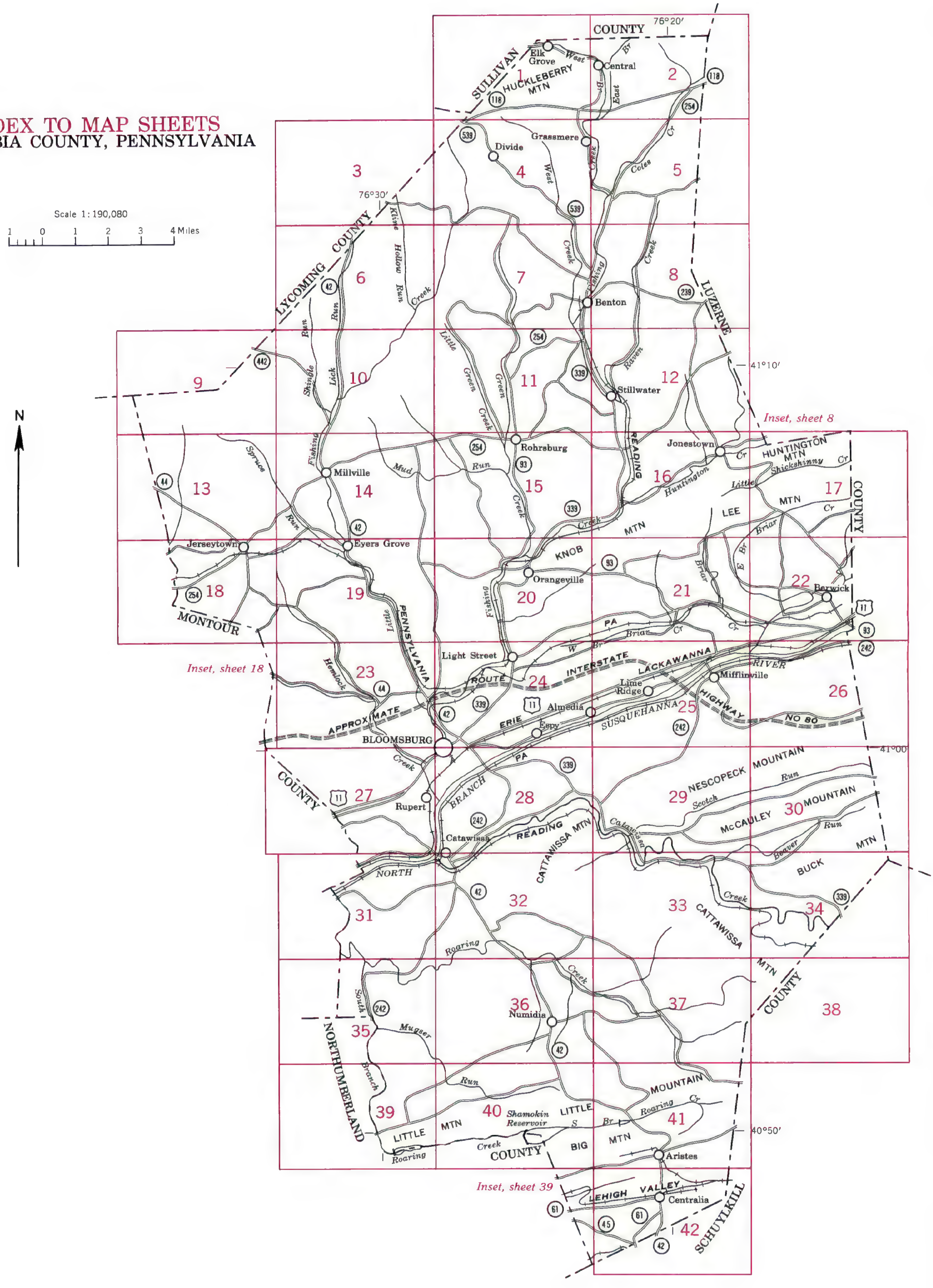
10 Dekalb-Edgemont association: Steep to gently sloping, yellowish stony soils on the mountains and ridges in the central and southern parts of the county

11 Laidig-Buchanan association: Moderately sloping, deep soils on colluvium at the foot of the mountains in the southern part of the county

12 Strip mines-Made land association: Gently sloping to steep areas where the soil has been disturbed by surface mining or other activity

August 1966

INDEX TO MAP SHEETS
COLUMBIA COUNTY, PENNSYLVANIA



SOIL LEGEND

The first capital letter is the initial one of the soil name. A second capital letter, A, B, C, D, E, or F shows the slope. Most symbols without a slope letter are those of nearly level soils. Soils that are named as moderately eroded or severely eroded have a final number, 2 or 3, in their symbol.

SYMBOL	NAME
AaA	Albrights gravelly silt loam, 0 to 3 percent slopes
AaB2	Albrights gravelly silt loam, 3 to 8 percent slopes, moderately eroded
AaC	Albrights gravelly silt loam, 8 to 15 percent slopes
AeA	Allenwood silt loam, 0 to 3 percent slopes
AeB2	Allenwood silt loam, 3 to 12 percent slopes, moderately eroded
AeC2	Allenwood silt loam, 12 to 20 percent slopes, moderately eroded
AnB2	Allis silt loam, neutral substratum, 3 to 8 percent slopes, moderately eroded
ArA	Alvira silt loam, 0 to 3 percent slopes
ArB	Alvira silt loam, 3 to 8 percent slopes
AsB2	Alvira shaly silt loam, 3 to 8 percent slopes, moderately eroded
AsC2	Alvira shaly silt loam, 8 to 15 percent slopes, moderately eroded
At	Atherton loam
Ba	Barbour fine sandy loam
Bb	Barbour gravelly loam
Bc	Barbour silt loam
Bd	Basher fine sandy loam
BeB2	Belmont silt loam, 3 to 12 percent slopes, moderately eroded
BeC2	Belmont silt loam, 12 to 20 percent slopes, moderately eroded
BkB2	Berks shaly silt loam, 3 to 12 percent slopes, moderately eroded
BkC2	Berks shaly silt loam, 12 to 20 percent slopes, moderately eroded
BrA	Braceville loam, 0 to 3 percent slopes
BrB	Braceville loam, 3 to 8 percent slopes
BuB	Buchanan cobbly loam, 3 to 8 percent slopes
BvB	Buchanan very stony loam, 0 to 8 percent slopes
CaB2	Calvin shaly silt loam, neutral substratum, 3 to 12 percent slopes, moderately eroded
CaC2	Calvin shaly silt loam, neutral substratum, 12 to 20 percent slopes, moderately eroded
CbD2	Calvin and Klinesville soils, neutral substrata, 20 to 35 percent slopes, moderately eroded
CbE2	Calvin and Klinesville soils, neutral substrata, 35 to 50 percent slopes, moderately eroded
CfB2	Canfield channery silt loam, 3 to 8 percent slopes, moderately eroded
CgA	Chenango gravelly sandy loam, 0 to 3 percent slopes
CgB2	Chenango gravelly sandy loam, 3 to 12 percent slopes, moderately eroded
CgC2	Chenango gravelly sandy loam, 12 to 20 percent slopes, moderately eroded
CgD3	Chenango gravelly sandy loam, 20 to 35 percent slopes, severely eroded
ChA	Chenango silt loam, 0 to 3 percent slopes
ChB2	Chenango silt loam, 3 to 12 percent slopes, moderately eroded
DeB2	Dekalb channery loam, 3 to 12 percent slopes, moderately eroded
DeC2	Dekalb channery loam, 12 to 20 percent slopes, moderately eroded
DkB	Dekalb very stony loam, 0 to 12 percent slopes
DkD	Dekalb very stony loam, 12 to 35 percent slopes
DkF	Dekalb very stony loam, 35 to 100 percent slopes
EaB	Edgemont very stony loam, 0 to 12 percent slopes
EaD	Edgemont very stony loam, 12 to 35 percent slopes
HnA	Hartleton channery silt loam, 0 to 3 percent slopes
HnB2	Hartleton channery silt loam, 3 to 12 percent slopes, moderately eroded
HnC2	Hartleton channery silt loam, 12 to 20 percent slopes, moderately eroded
HnC3	Hartleton channery silt loam, 12 to 20 percent slopes, severely eroded
HnD2	Hartleton channery silt loam, 20 to 35 percent slopes, moderately eroded
HnD3	Hartleton channery silt loam, 20 to 35 percent slopes, severely eroded
HrB	Hartleton very stony silt loam, 0 to 12 percent slopes
HrD	Hartleton very stony silt loam, 12 to 35 percent slopes
Hs	Holly silt loam

SYMBOL	NAME
KaB2	Klinesville shaly silt loam, 3 to 12 percent slopes, moderately eroded
KaC2	Klinesville shaly silt loam, 12 to 20 percent slopes, moderately eroded
KaC3	Klinesville shaly silt loam, 12 to 20 percent slopes, severely eroded
KaD2	Klinesville shaly silt loam, 20 to 35 percent slopes, moderately eroded
KaD3	Klinesville shaly silt loam, 20 to 35 percent slopes, severely eroded
KkE	Klinesville and Leck Kill shaly silt loams, 35 to 70 percent slopes
KlB	Klinesville and Leck Kill very stony silt loams, 0 to 12 percent slopes
KlD	Klinesville and Leck Kill very stony silt loams, 12 to 35 percent slopes
KlF	Klinesville and Leck Kill very stony silt loams, 35 to 100 percent slopes
LaB2	Lackawanna channery loam, 3 to 12 percent slopes, moderately eroded
LaC2	Lackawanna channery loam, 12 to 20 percent slopes, moderately eroded
LaD2	Lackawanna channery loam, 20 to 35 percent slopes, moderately eroded
LcB	Lackawanna very stony loam, 0 to 12 percent slopes
LcD	Lackawanna very stony loam, 12 to 35 percent slopes
LdF	Lackawanna and Oquaga very stony soils, 35 to 100 percent slopes
LeB2	Laidig gravelly loam, 3 to 12 percent slopes, moderately eroded
LeC2	Laidig gravelly loam, 12 to 20 percent slopes, moderately eroded
LfB	Laidig very stony loam, 0 to 12 percent slopes
LfD	Laidig very stony loam, 12 to 35 percent slopes
LgB	Lawrenceville and Duncannon silt loams, 3 to 8 percent slopes
LgC2	Lawrenceville and Duncannon silt loams, 8 to 12 percent slopes, moderately eroded
LkA	Leck Kill channery silt loam, 0 to 3 percent slopes
LkB2	Leck Kill channery silt loam, 3 to 12 percent slopes, moderately eroded
LkC2	Leck Kill channery silt loam, 12 to 20 percent slopes, moderately eroded
LkC3	Leck Kill channery silt loam, 12 to 20 percent slopes, severely eroded
LkD2	Leck Kill channery silt loam, 20 to 35 percent slopes, moderately eroded
LkD3	Leck Kill channery silt loam, 20 to 35 percent slopes, severely eroded
LlA	Leck Kill channery silt loam, deep, 0 to 3 percent slopes
LlB2	Leck Kill channery silt loam, deep, 3 to 12 percent slopes, moderately eroded
LlC2	Leck Kill channery silt loam, deep, 12 to 20 percent slopes, moderately eroded
LlC3	Leck Kill channery silt loam, deep, 12 to 20 percent slopes, severely eroded
LmB	Leck Kill very stony silt loam, deep, 0 to 12 percent slopes
LmD	Leck Kill very stony silt loam, deep, 12 to 35 percent slopes
LmE	Leck Kill very stony silt loam, deep, 35 to 60 percent slopes
Ln	Lickdale silt loam
Lo	Lickdale very stony silt loam
LpB2	Litz silt loam, 3 to 12 percent slopes, moderately eroded
LpC2	Litz silt loam, 12 to 20 percent slopes, moderately eroded
LrC3	Litz and Weikert shaly silt loams, 12 to 20 percent slopes, severely eroded
LrD3	Litz and Weikert shaly silt loams, 20 to 35 percent slopes, severely eroded
LrE2	Litz and Weikert shaly silt loams, 35 to 50 percent slopes, moderately eroded
LsB2	Lordstown channery silt loam, 3 to 12 percent slopes, moderately eroded
LsC2	Lordstown channery silt loam, 12 to 20 percent slopes, moderately eroded
LsD2	Lordstown channery silt loam, 20 to 35 percent slopes, moderately eroded

SYMBOL	NAME
LtB	Lordstown very stony silt loam, 0 to 12 percent slopes
LtD	Lordstown very stony silt loam, 12 to 35 percent slopes
LtF	Lordstown very stony silt loam, 35 to 100 percent slopes
Ma	Made land
Mb	Middlebury fine sandy loam
Md	Middlebury silt loam
Mn	Mine dumps
MrB	Morris channery silt loam, 3 to 8 percent slopes
MsB	Morris very stony silt loam, 0 to 8 percent slopes
Mu	Mucky peat
OcB2	Oquaga channery silt loam, 3 to 12 percent slopes, moderately eroded
OcC2	Oquaga channery silt loam, 12 to 20 percent slopes, moderately eroded
OcD2	Oquaga channery silt loam, 20 to 35 percent slopes, moderately eroded
OsB	Oquaga very stony silt loam, 0 to 12 percent slopes
OsD	Oquaga very stony silt loam, 12 to 35 percent slopes
Pa	Papakating silty clay loam
PkA	Pekin silt loam, cobbly variant, 0 to 3 percent slopes
PkB2	Pekin silt loam, cobbly variant, 3 to 8 percent slopes, moderately eroded
RaA	Ravenna channery silt loam, 0 to 3 percent slopes
RaB	Ravenna channery silt loam, 3 to 8 percent slopes
Rw	Riverwash
SdA	Shelmadine silt loam, 0 to 3 percent slopes
SdB2	Shelmadine silt loam, 3 to 8 percent slopes, moderately eroded
Sh	Shelmadine very stony silt loam
Sp	Steep very stony land
St	Strip mine spoil
Tf	Tioga fine sandy loam
Tg	Tioga gravelly loam
Ts	Tioga silt loam
Tt	Tioga silt loam, high bottom
WaA	Washington silt loam, 0 to 3 percent slopes
WaB2	Washington silt loam, 3 to 12 percent slopes, moderately eroded
WaC2	Washington silt loam, 12 to 20 percent slopes, moderately eroded
WbA	Watson silt loam, 0 to 3 percent slopes
WbB2	Watson silt loam, 3 to 8 percent slopes, moderately eroded
WbC2	Watson silt loam, 8 to 15 percent slopes, moderately eroded
WcB2	Weikert channery silt loam, 3 to 12 percent slopes, moderately eroded
WcC2	Weikert channery silt loam, 12 to 20 percent slopes, moderately eroded
WcD2	Weikert channery silt loam, 20 to 35 percent slopes, moderately eroded
WcF2	Weikert channery silt loam, 35 to 80 percent slopes, moderately eroded
WeD	Weikert very stony silt loam, 12 to 35 percent slopes
WeF	Weikert very stony silt loam, 35 to 80 percent slopes
WfB2	Wellsboro channery silt loam, 3 to 8 percent slopes, moderately eroded
WfC2	Wellsboro channery silt loam, 8 to 15 percent slopes, moderately eroded
WhB	Wellsboro very stony silt loam, 0 to 8 percent slopes
WmB2	Westmoreland silt loam, 3 to 12 percent slopes, moderately eroded
WmC2	Westmoreland silt loam, 12 to 20 percent slopes, moderately eroded
WnA	Wiltshire silt loam, 0 to 3 percent slopes
WnB2	Wiltshire silt loam, 3 to 8 percent slopes, moderately eroded
WnC2	Wiltshire silt loam, 8 to 15 percent slopes, moderately eroded
WoB2	Wooster channery silt loam, 3 to 12 percent slopes, moderately eroded
WoC2	Wooster channery silt loam, 12 to 20 percent slopes, moderately eroded
WoD2	Wooster channery silt loam, 20 to 35 percent slopes, moderately eroded
WpD	Wooster very stony silt loam, 12 to 35 percent slopes
WsB	Wooster and Canfield very stony loams, 0 to 12 percent slopes
Zp	Zipp silt loam

Soil map constructed 1966 by Cartographic Division, Soil Conservation Service, USDA, from 1959 aerial photographs. Controlled mosaic based on Pennsylvania plane coordinate system, north zone, Lambert conformal conic projection, 1927 North American datum.

GUIDE TO MAPPING UNITS

[See table 1, p. 12, for the estimated productivity ratings of soils for specified crops; table 2, p. 19, for the potential productivity, suitable trees, and hazards of woodland suitability groups; and table 8, p. 68, for the approximate acreage and proportionate extent of soils. For information about engineering, see the subsection "Engineering Applications"]

Map symbol	Mapping unit	Described on page	Capability unit		Building site group	
			Symbol	Page	Number	Page
AaA	Albrights gravelly silt loam, 0 to 3 percent slopes	70	IIw-2	7	8	66
AaB2	Albrights gravelly silt loam, 3 to 8 percent slopes, moderately eroded	70	IIe-3	7	8	66
AaC	Albrights gravelly silt loam, 8 to 15 percent slopes	70	IIIe-2	8	9	66
AeA	Allenwood silt loam, 0 to 3 percent slopes	70	I-1	6	1	45
AeB2	Allenwood silt loam, 3 to 12 percent slopes, moderately eroded	70	IIe-1	6	1	45
AeC2	Allenwood silt loam, 12 to 20 percent slopes, moderately eroded	70	IIIe-1	8	2	45
AnB2	Allis silt loam, neutral substratum, 3 to 8 percent slopes, moderately eroded	71	IVw-1	9	10	67
ArA	Alvira silt loam, 0 to 3 percent slopes	71	IIIw-1	8	10	67
ArB	Alvira silt loam, 3 to 8 percent slopes	71	IIIw-1	8	10	67
AsB2	Alvira shaly silt loam, 3 to 8 percent slopes, moderately eroded	71	IIIw-1	8	10	67
AsC2	Alvira shaly silt loam, 8 to 15 percent slopes, moderately eroded	71	IIIe-2	8	10	67
At	Atherton loam	72	IIIw-2	9	10	67
Ba	Barbour fine sandy loam	72	I-2	6	11	67
Bb	Barbour gravelly loam	72	I-2	6	11	67
Bc	Barbour silt loam	72	I-2	6	11	67
Bd	Basher fine sandy loam	73	IIw-1	7	11	67
BeB2	Belmont silt loam, 3 to 12 percent slopes, moderately eroded	73	IIe-1	6	1	45
BeC2	Belmont silt loam, 12 to 20 percent slopes, moderately eroded	73	IIIe-1	8	2	45
BkB2	Berks shaly silt loam, 3 to 12 percent slopes, moderately eroded	74	IIe-5	7	5	66
BkC2	Berks shaly silt loam, 12 to 20 percent slopes, moderately eroded	74	IIIe-3	8	6	66
BrA	Braceville loam, 0 to 3 percent slopes	74	IIw-3	7	8	66
BrB	Braceville loam, 3 to 8 percent slopes	74	IIe-3	7	8	66
BuB	Buchanan cobbly loam, 3 to 8 percent slopes	75	IVe-2	9	8	66
BvB	Buchanan very stony loam, 0 to 8 percent slopes	75	VIs-3	10	8	66
CaB2	Calvin shaly silt loam, neutral substratum, 3 to 12 percent slopes, moderately eroded	75	IIe-4	7	5	66
CaC2	Calvin shaly silt loam, neutral substratum, 12 to 20 percent slopes, moderately eroded	75	IIIe-4	8	6	66
CbD2	Calvin and Klinesville soils, neutral substrata, 20 to 35 percent slopes, moderately eroded	75	IVe-3	9	6	66
CbE2	Calvin and Klinesville soils, neutral substrata, 35 to 50 percent slopes, moderately eroded	76	VIIe-1	10	7	66
CfB2	Canfield channery silt loam, 3 to 8 percent slopes, moderately eroded	76	IIe-3	7	8	66
CgA	Chenango gravelly sandy loam, 0 to 3 percent slopes	76	IIs-1	8	1	45
CgB2	Chenango gravelly sandy loam, 3 to 12 percent slopes, moderately eroded	76	IIs-1	8	1	45
CgC2	Chenango gravelly sandy loam, 12 to 20 percent slopes, moderately eroded	76	IIIe-5	8	2	45
CgD3	Chenango gravelly sandy loam, 20 to 35 percent slopes, severely eroded	77	IVe-5	9	2	45
ChA	Chenango silt loam, 0 to 3 percent slopes	77	I-1	6	1	45
ChB2	Chenango silt loam, 3 to 12 percent slopes, moderately eroded	77	IIe-2	6	1	45
DaB2	Dekalb channery loam, 3 to 12 percent slopes, moderately eroded	77	IIe-4	7	3	52
DaC2	Dekalb channery loam, 12 to 20 percent slopes, moderately eroded	77	IIIe-4	8	4	53
DkB	Dekalb very stony loam, 0 to 12 percent slopes	77	VIs-2	10	3	52
DkD	Dekalb very stony loam, 12 to 35 percent slopes	78	VIs-2	10	4	53
DkF	Dekalb very stony loam, 35 to 100 percent slopes	78	VIIs-1	11	7	66
EdB	Edgemont very stony loam, 0 to 12 percent slopes	78	VIs-1	10	3	52
EdD	Edgemont very stony loam, 12 to 35 percent slopes	78	VIs-1	10	4	53
HhA	Hartleton channery silt loam, 0 to 3 percent slopes	79	IIs-2	8	3	52
HhB2	Hartleton channery silt loam, 3 to 12 percent slopes, moderately eroded	79	IIe-5	7	3	52
HhC2	Hartleton channery silt loam, 12 to 20 percent slopes, moderately eroded	79	IIIe-3	8	4	53
HhC3	Hartleton channery silt loam, 12 to 20 percent slopes, severely eroded	79	IVe-1	9	4	53
HhD2	Hartleton channery silt loam, 20 to 35 percent slopes, moderately eroded	79	IVe-5	9	4	53
HhD3	Hartleton channery silt loam, 20 to 35 percent slopes, severely eroded	79	VIe-3	10	4	53
HrB	Hartleton very stony silt loam, 0 to 12 percent slopes	79	VIs-2	10	3	52
HrD	Hartleton very stony silt loam, 12 to 35 percent slopes	79	VIs-2	10	4	53
Hs	Holly silt loam	80	IIIw-2	9	11	67
KaB2	Klinesville shaly silt loam, 3 to 12 percent slopes, moderately eroded	80	IIIe-4	8	5	66
KaC2	Klinesville shaly silt loam, 12 to 20 percent slopes, moderately eroded	80	IVe-3	9	6	66
KaC3	Klinesville shaly silt loam, 12 to 20 percent slopes, severely eroded	80	VIe-1	10	6	66
KaD2	Klinesville shaly silt loam, 20 to 35 percent slopes, moderately eroded	80	VIe-2	10	6	66
KaD3	Klinesville shaly silt loam, 20 to 35 percent slopes, severely eroded	80	VIIe-1	10	6	66
KkE	Klinesville and Leck Kill shaly silt loams, 35 to 70 percent slopes	80	VIIe-1	10	7	66
KlB	Klinesville and Leck Kill very stony silt loams, 0 to 12 percent slopes	80	VIs-2	10	5	66
KlD	Klinesville and Leck Kill very stony silt loams, 12 to 35 percent slopes	80	VIs-2	10	6	66
KlF	Klinesville and Leck Kill very stony silt loams, 35 to 100 percent slopes	81	VIIs-1	11	7	66
LaB2	Lackawanna channery loam, 3 to 12 percent slopes, moderately eroded	81	IIe-1	6	1	45
LaC2	Lackawanna channery loam, 12 to 20 percent slopes, moderately eroded	81	IIIe-1	8	2	45
LaD2	Lackawanna channery loam, 20 to 35 percent slopes, moderately eroded	81	IVe-4	9	2	45
LcB	Lackawanna very stony loam, 0 to 12 percent slopes	81	VIs-1	10	3	52
LcD	Lackawanna very stony loam, 12 to 35 percent slopes	81	VIs-1	10	4	53
LdF	Lackawanna and Oquaga very stony soils, 35 to 100 percent slopes	81	VIIs-1	11	7	66
LeB2	Laidig gravelly loam, 3 to 12 percent slopes, moderately eroded	82	IIe-2	6	1	45
LeC2	Laidig gravelly loam, 12 to 20 percent slopes, moderately eroded	82	IIIe-5	8	2	45
LfB	Laidig very stony loam, 0 to 12 percent slopes	82	VIs-1	10	3	52
LfD	Laidig very stony loam, 12 to 35 percent slopes	82	VIs-1	10	4	53
LgB	Lawrenceville and Duncannon silt loams, 3 to 8 percent slopes	82	IIe-3	7	8	66
LgC2	Lawrenceville and Duncannon silt loams, 8 to 12 percent slopes, moderately eroded	82	IIIe-2	8	9	66

215-877 O - 67 (Face blank p. 140) No. 1

Map symbol	Mapping unit	Described on page	Capability unit: Symbol	Capability unit: Page	Building site group: Number	Building site group: Page
LkA	Leck Kill channery silt loam, 0 to 3 percent slopes	83	IIs-2	8	3	52
LkB2	Leck Kill channery silt loam, 3 to 12 percent slopes, moderately eroded	83	IIe-5	7	3	52
LkC2	Leck Kill channery silt loam, 12 to 20 percent slopes, moderately eroded	83	IIIe-3	8	4	53
LkC3	Leck Kill channery silt loam, 12 to 20 percent slopes, severely eroded	83	IVe-1	9	4	53
LkD2	Leck Kill channery silt loam, 20 to 35 percent slopes, moderately eroded	83	IVe-5	9	4	53
LkD3	Leck Kill channery silt loam, 20 to 35 percent slopes, severely eroded	83	VIe-3	10	4	53
LlA	Leck Kill channery silt loam, deep, 0 to 3 percent slopes	83	I-1	6	1	45
LlB2	Leck Kill channery silt loam, deep, 3 to 12 percent slopes, moderately eroded	83	IIe-1	6	1	45
LlC2	Leck Kill channery silt loam, deep, 12 to 20 percent slopes, moderately eroded	83	IIIe-1	8	2	45
LlC3	Leck Kill channery silt loam, deep, 12 to 20 percent slopes, severely eroded	84	IVe-1	9	2	45
LmB	Leck Kill very stony silt loam, deep, 0 to 12 percent slopes	84	VIs-1	10	3	52
LmD	Leck Kill very stony silt loam, deep, 12 to 35 percent slopes	84	VIs-1	10	4	53
LmE	Leck Kill very stony silt loam, deep, 35 to 60 percent slopes	84	VIIs-2	11	7	66
Ln	Lickdale silt loam	84	IVw-2	10	10	67
Lo	Lickdale very stony silt loam	84	VIIs-3	11	10	67
LpB2	Litz silt loam, 3 to 12 percent slopes, moderately eroded	85	IIIe-3	8	5	66
LpC2	Litz silt loam, 12 to 20 percent slopes, moderately eroded	85	IVe-1	9	6	66
LrC3	Litz and Weikert shaly silt loams, 12 to 20 percent slopes, severely eroded	85	VIe-1	10	6	66
LrD3	Litz and Weikert shaly silt loams, 20 to 35 percent slopes, severely eroded	85	VIIe-1	10	6	66
LrE2	Litz and Weikert shaly silt loams, 35 to 50 percent slopes, moderately eroded	85	VIIe-1	10	7	66
LsB2	Lordstown channery silt loam, 3 to 12 percent slopes, moderately eroded	85	IIe-4	7	3	52
LsC2	Lordstown channery silt loam, 12 to 20 percent slopes, moderately eroded	85	IIIe-4	8	4	53
LsD2	Lordstown channery silt loam, 20 to 35 percent slopes, moderately eroded	85	IVe-5	9	4	53
LtB	Lordstown very stony silt loam, 0 to 12 percent slopes	86	VIs-2	10	3	52
LtD	Lordstown very stony silt loam, 12 to 35 percent slopes	86	VIs-2	10	4	53
LtF	Lordstown very stony silt loam, 35 to 100 percent slopes	86	VIIs-1	11	7	66
Ma	Made land	86	VIIIs-1	11	--	--
Mb	Middlebury fine sandy loam	86	IIw-1	7	11	67
Md	Middlebury silt loam	86	IIw-1	7	11	67
Mn	Mine dumps	86	VIIIs-1	11	---	--
MrB	Morris channery silt loam, 3 to 8 percent slopes	87	IIIw-1	8	10	67
MsB	Morris very stony silt loam, 0 to 8 percent slopes	87	VIIs-3	11	10	67
Mu	Mucky peat	87	VIIIw-1	11	11	67
OcB2	Oquaga channery silt loam, 3 to 12 percent slopes, moderately eroded	87	IIe-4	7	5	66
OcC2	Oquaga channery silt loam, 12 to 20 percent slopes, moderately eroded	87	IIIe-4	8	6	66
OcD2	Oquaga channery silt loam, 20 to 35 percent slopes, moderately eroded	87	IVe-5	9	6	66
OsB	Oquaga very stony silt loam, 0 to 12 percent slopes	87	VIs-2	10	5	66
OsD	Oquaga very stony silt loam, 12 to 35 percent slopes	88	VIs-2	10	6	66
Pa	Papakating silty clay loam	88	IVw-2	10	11	67
PkA	Pekin silt loam, cobbly variant, 0 to 3 percent slopes	88	IIw-3	7	8	66
PkB2	Pekin silt loam, cobbly variant, 3 to 8 percent slopes, moderately eroded	88	IIe-3	7	8	66
RaA	Ravenna channery silt loam, 0 to 3 percent slopes	89	IIIw-1	8	10	67
RaB	Ravenna channery silt loam, 3 to 8 percent slopes	89	IIIw-1	8	10	67
Rw	Riverwash	89	VIIIs-1	11	--	--
SdA	Shelmadine silt loam, 0 to 3 percent slopes	89	IVw-1	9	10	67
SdB2	Shelmadine silt loam, 3 to 8 percent slopes, moderately eroded	89	IVw-1	9	10	67
Sh	Shelmadine very stony silt loam	89	VIIs-3	11	10	67
Sp	Steep very stony land	89	VIIIs-1	11	--	--
St	Strip mine spoil	89	VIIIs-1	11	--	--
Tf	Tioga fine sandy loam	90	I-2	6	11	67
Tg	Tioga gravelly loam	90	I-2	6	11	67
Ts	Tioga silt loam	90	I-2	6	11	67
Tt	Tioga silt loam, high bottom	90	I-2	6	11	67
WaA	Washington silt loam, 0 to 3 percent slopes	91	I-1	6	1	45
WaB2	Washington silt loam, 3 to 12 percent slopes, moderately eroded	91	IIe-1	6	1	45
WaC2	Washington silt loam, 12 to 20 percent slopes, moderately eroded	91	IIIe-1	8	2	45
WbA	Watson silt loam, 0 to 3 percent slopes	91	IIw-2	7	8	66
WbB2	Watson silt loam, 3 to 8 percent slopes, moderately eroded	91	IIe-3	7	8	66
WbC2	Watson silt loam, 8 to 15 percent slopes, moderately eroded	91	IIIe-2	8	9	66
WcB2	Weikert channery silt loam, 3 to 12 percent slopes, moderately eroded	92	IIIe-4	8	5	66
WcC2	Weikert channery silt loam, 12 to 20 percent slopes, moderately eroded	92	IVe-3	9	6	66
WcD2	Weikert channery silt loam, 20 to 35 percent slopes, moderately eroded	92	VIe-2	10	6	66
WcF2	Weikert channery silt loam, 35 to 80 percent slopes, moderately eroded	92	VIIe-1	10	7	66
WeD	Weikert very stony silt loam, 12 to 35 percent slopes	92	VIs-2	10	6	66
WeF	Weikert very stony silt loam, 35 to 80 percent slopes	92	VIIs-1	11	7	66
WfB2	Wellsboro channery silt loam, 3 to 8 percent slopes, moderately eroded	92	IIe-3	7	8	66
WfC2	Wellsboro channery silt loam, 8 to 15 percent slopes, moderately eroded	92	IIIe-2	8	9	66
WhB	Wellsboro very stony silt loam, 0 to 8 percent slopes	92	VIs-3	10	8	66
WmB2	Westmoreland silt loam, 3 to 12 percent slopes, moderately eroded	93	IIe-1	6	1	45
WmC2	Westmoreland silt loam, 12 to 20 percent slopes, moderately eroded	93	IIIe-1	8	2	45
WnA	Wiltshire silt loam, 0 to 3 percent slopes	93	IIw-2	7	8	66
WnB2	Wiltshire silt loam, 3 to 8 percent slopes, moderately eroded	93	IIe-3	7	8	66
WnC2	Wiltshire silt loam, 8 to 15 percent slopes, moderately eroded	94	IIIe-2	8	9	66
WoB2	Wooster channery silt loam, 3 to 12 percent slopes, moderately eroded	94	IIe-1	6	1	45
WoC2	Wooster channery silt loam, 12 to 20 percent slopes, moderately eroded	94	IIIe-1	8	2	45
WoD2	Wooster channery silt loam, 20 to 35 percent slopes, moderately eroded	94	IVe-4	9	2	45
WpD	Wooster very stony silt loam, 12 to 35 percent slopes	94	VIs-1	10	4	53
WsB	Wooster and Canfield very stony loams, 0 to 12 percent slopes	94	VIs-1	10	3	52
Zp	Zipp silt loam	95	IIIw-2	9	10	67

215-877 O - 67 (Face blank p. 140) No. 2

COLUMBIA COUNTY, PENNSYLVANIA — SHEET NUMBER 1

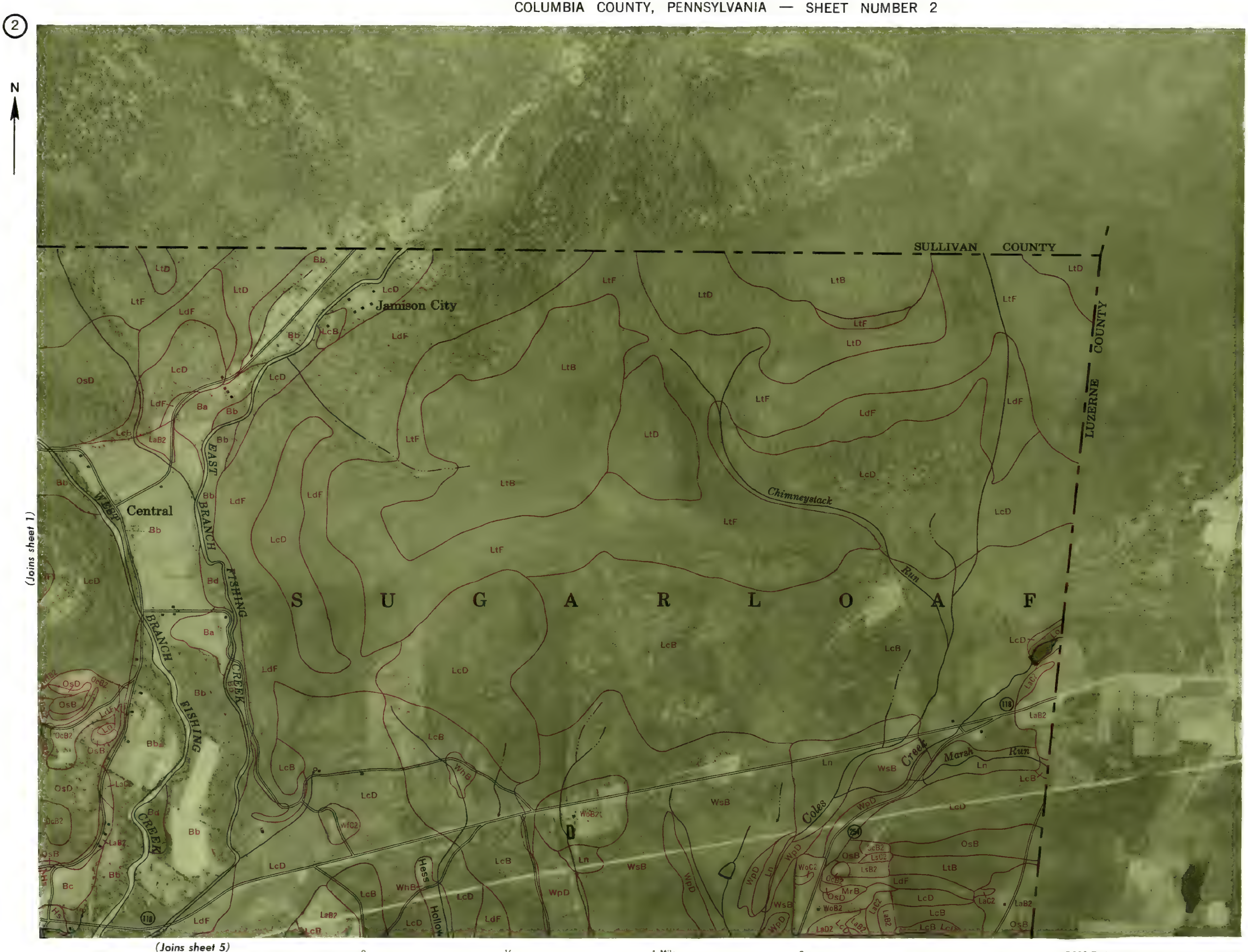
1

(Joins sheet 4)

0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Pennsylvania State University College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Conservation Commission.

2



0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

3

N

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Pennsylvania State University College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Conservation Commission.

COLUMBIA COUNTY, PENNSYLVANIA — SHEET NUMBER 4

(Joins sheet 2)

(Joins sheet 4)

(Joins sheet 8)

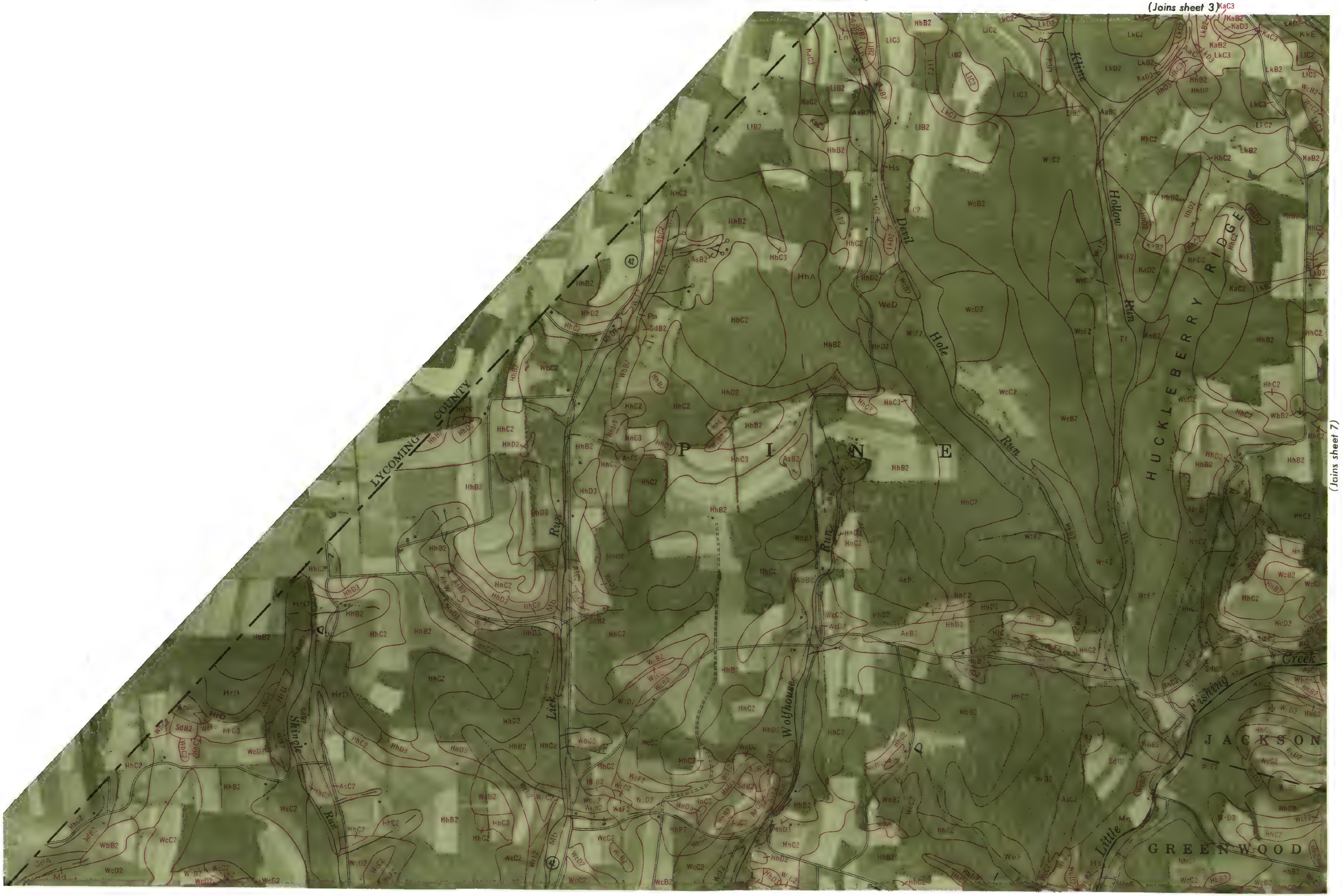
0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Pennsylvania State University College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Conservation Commission.

COLUMBIA COUNTY, PENNSYLVANIA — SHEET NUMBER 6

N

(Joins sheet 3)



(Joins sheet 7)

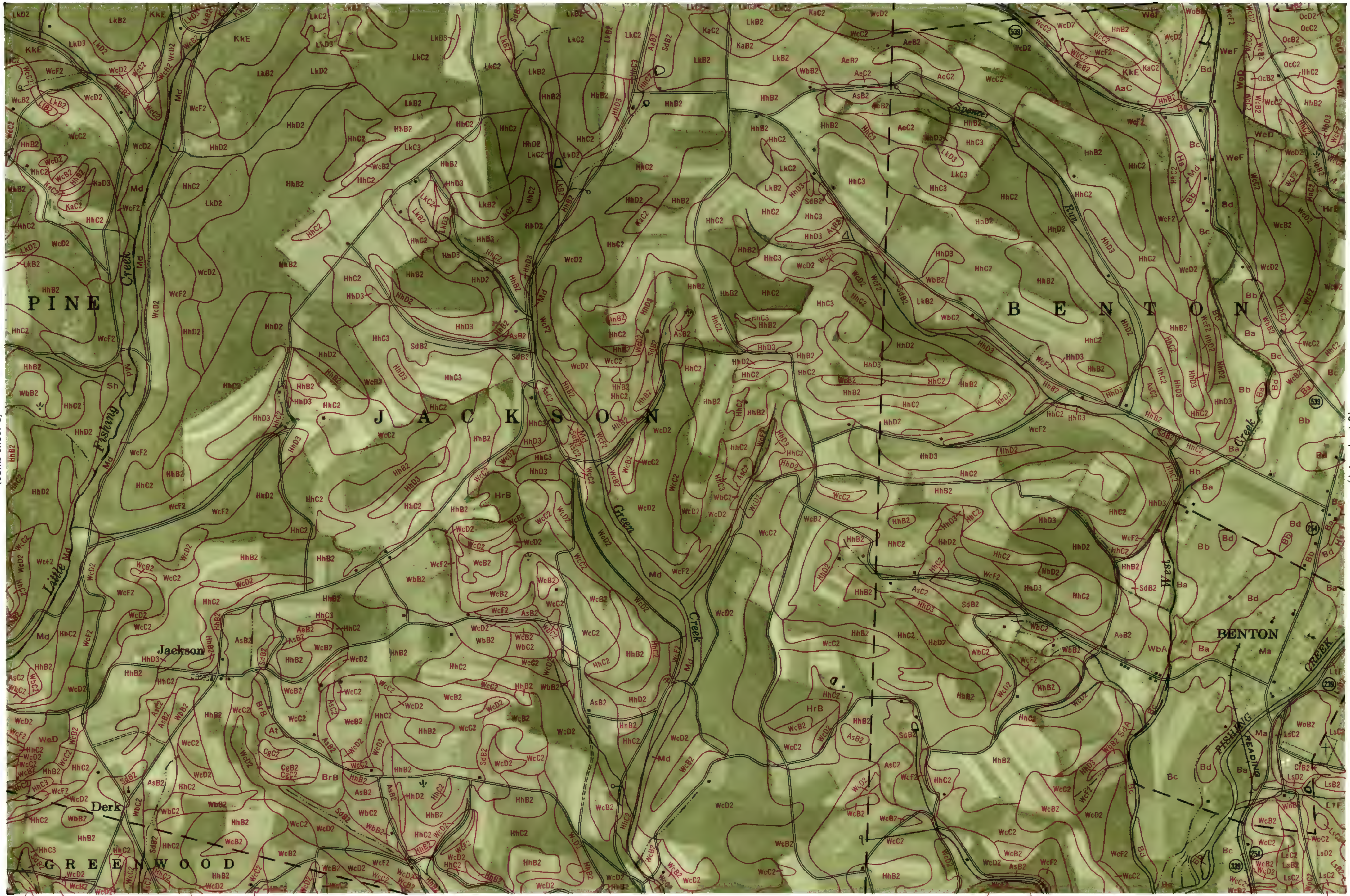
(Joins sheet 10)

0 ½ 1 Mile Scale 1:20 000 0 5 000 Feet

(Joins sheet 4)

(Joins sheet 6)

(Joins sheet 8)



(Joins sheet 11)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

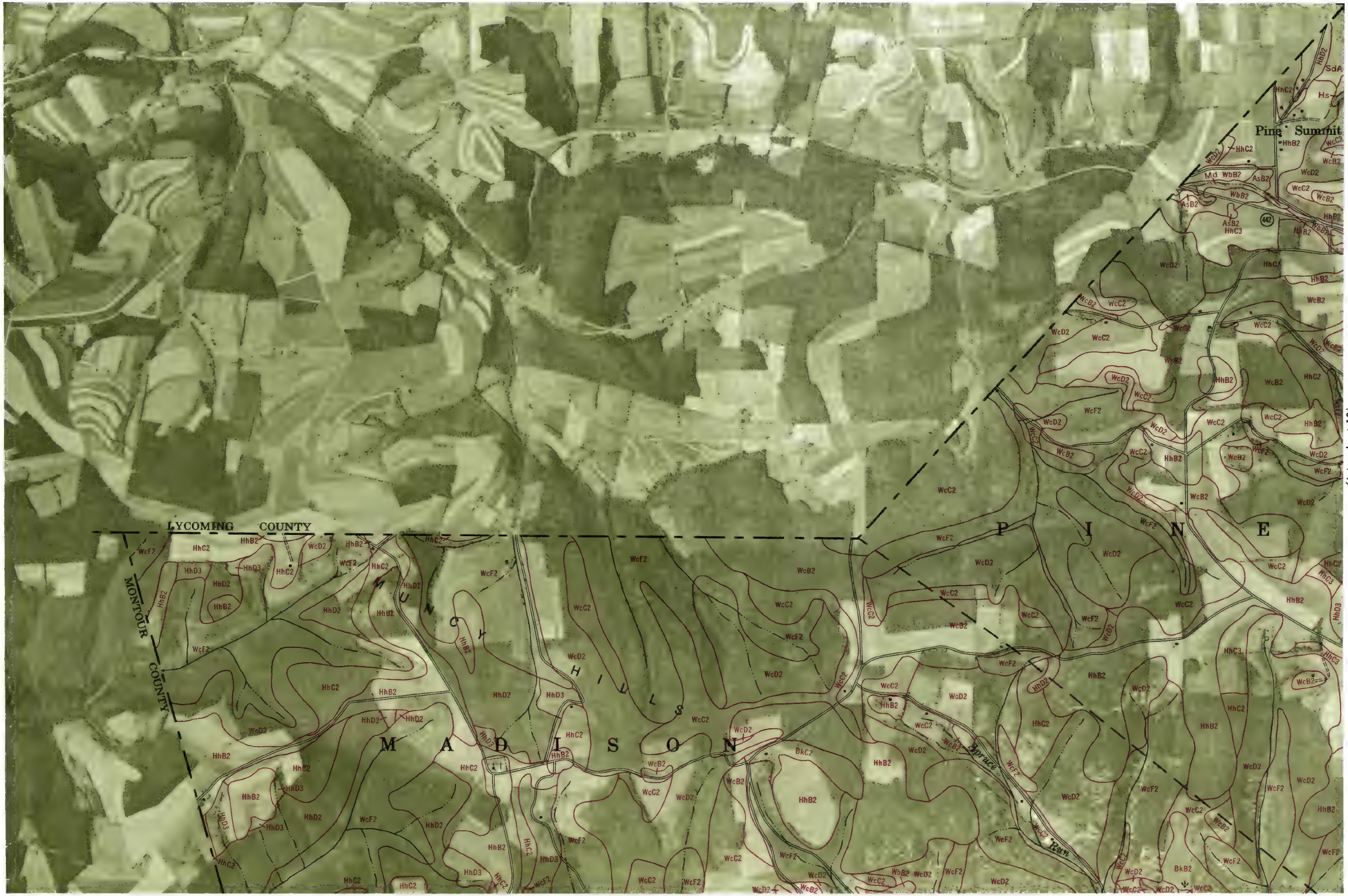
This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Pennsylvania State University College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Conservation Commission.

8

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

9

N



(Joins sheet 10)

(Joins sheet 13)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

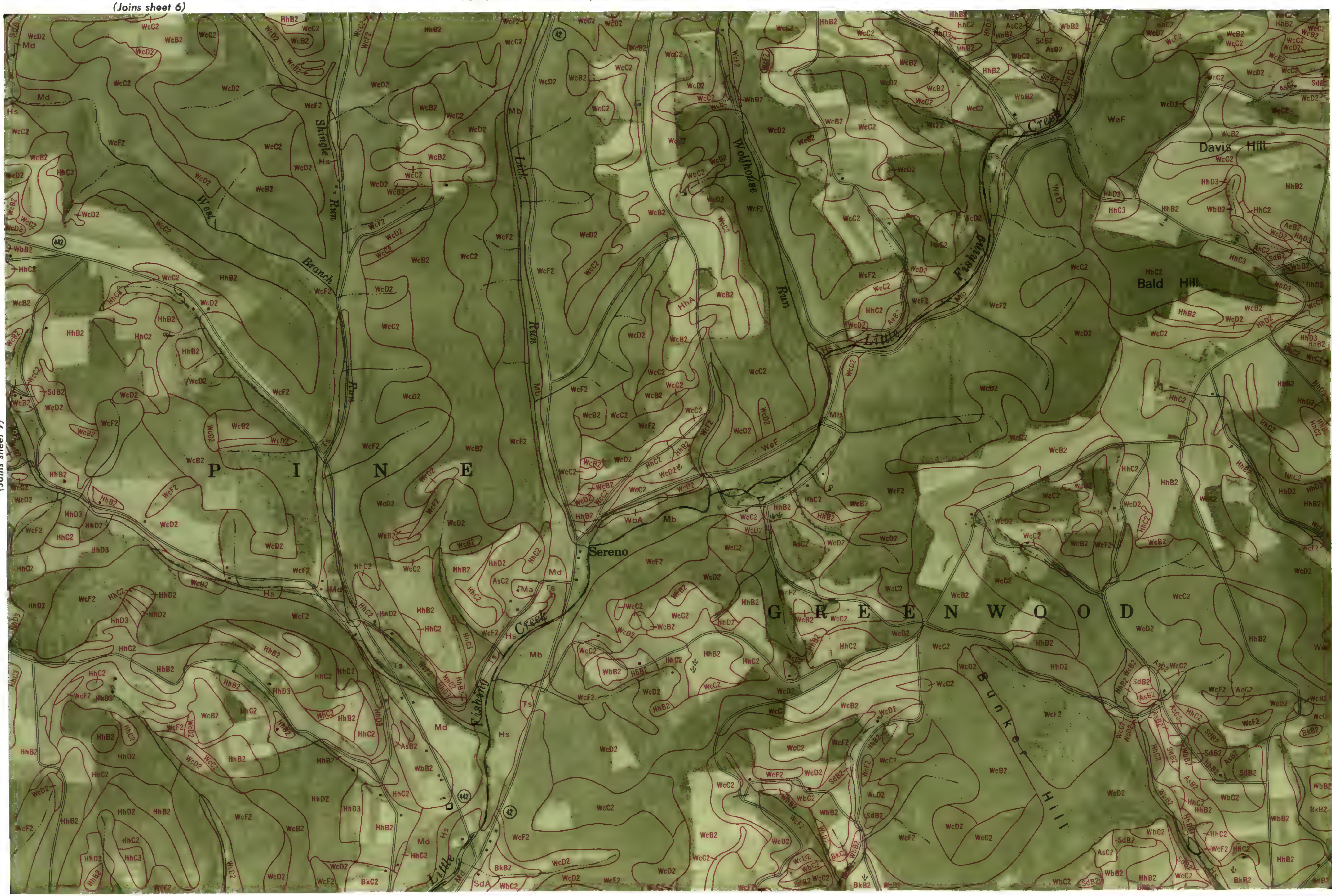
This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Pennsylvania State University College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Conservation Commission.

10

N

(Joins sheet 6)

(Joins sheet 9)



(Joins sheet 11)

(Joins sheet 14)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

(Joins sheet 7)

11

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Pennsylvania State University College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Conservation Commission.

(Joins sheet 10)

(Joins sheet 12)

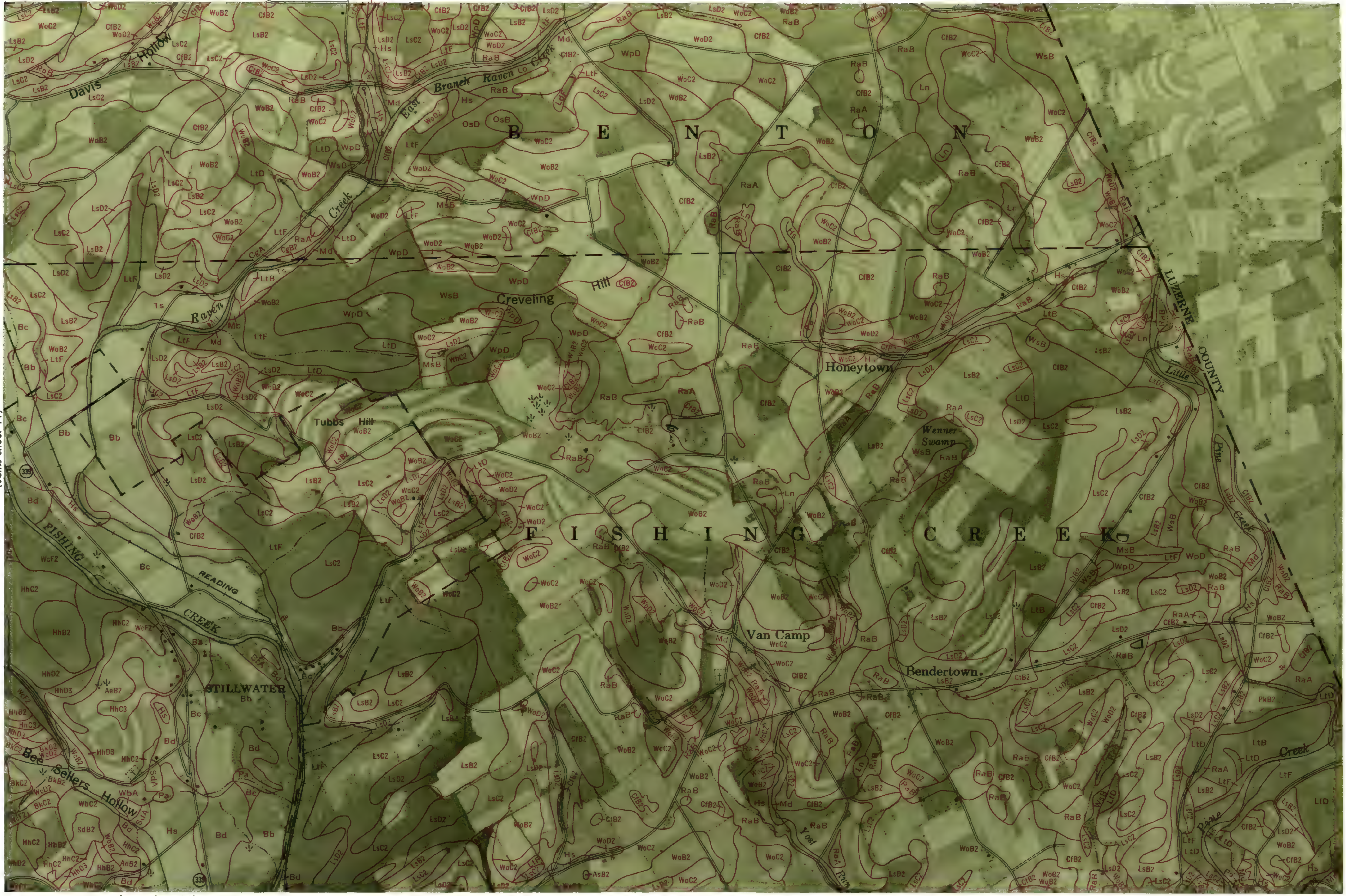
(Joins sheet 15)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

12

(Joins sheet 8)

N

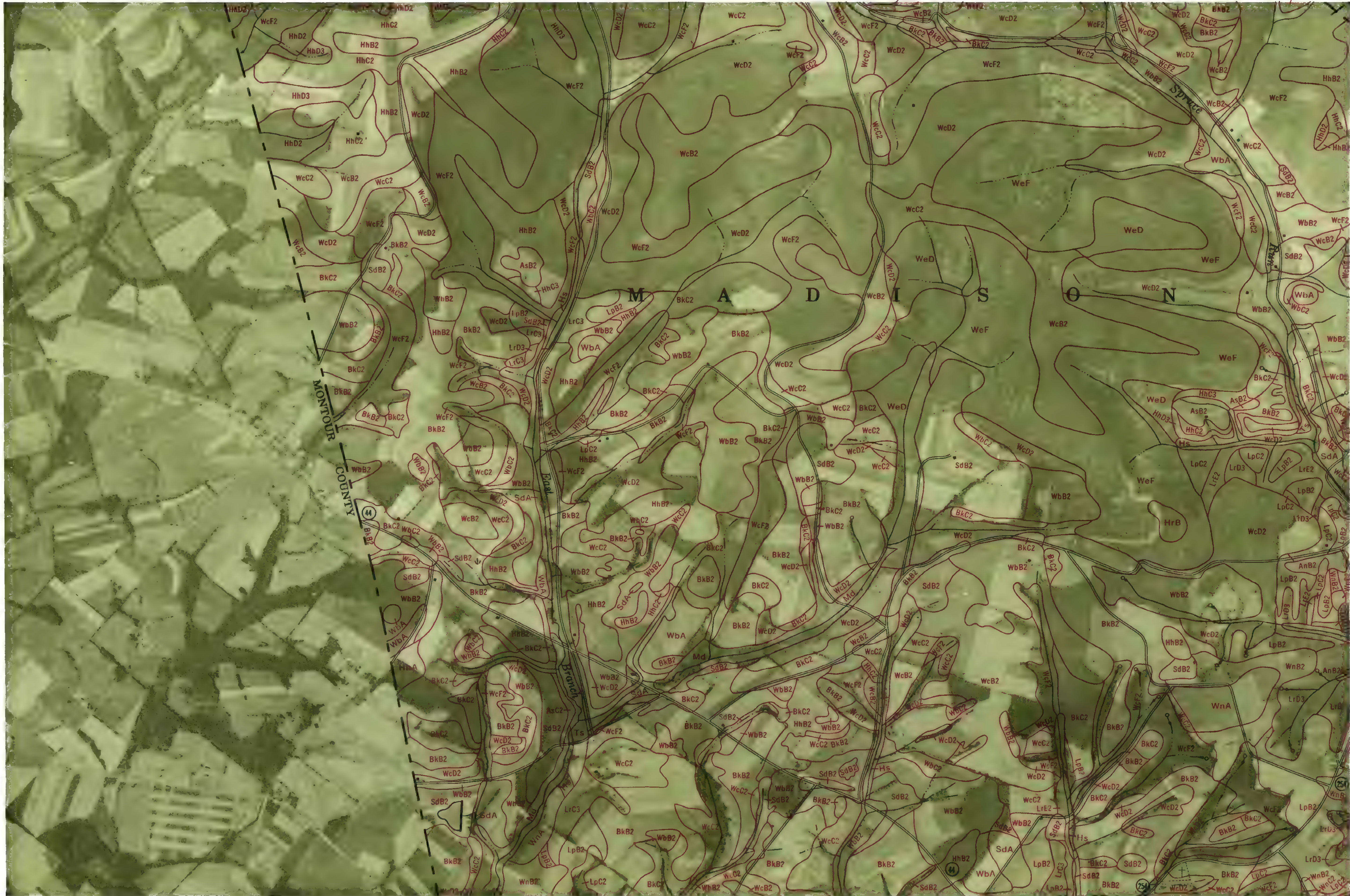


(Joins sheet 11)

(Joins inset, sheet 8)

(Joins sheet 16)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet



0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Pennsylvania State University College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Conservation Commission.

14

(Joins sheet 10)

N

(Joins sheet 13)

(Joins sheet 15)

(Joins sheet 19)

0 ½ 1 Mile

Scale 1:20 000

0 5000 Feet

(Joins sheet 11)

15

N

(Joins sheet 14)

(Joins sheet 16)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

(Joins sheet 20)

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Pennsylvania State University College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Conservation Commission.

COLUMBIA COUNTY, PENNSYLVANIA — SHEET NUMBER 16

(Joins sheet 12)

(Joins sheet 15)

(Joins sheet 17)

(Joins sheet 21)

0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

(Joins inset, sheet 8)

(Joins sheet 16)

(Joins sheet 22)

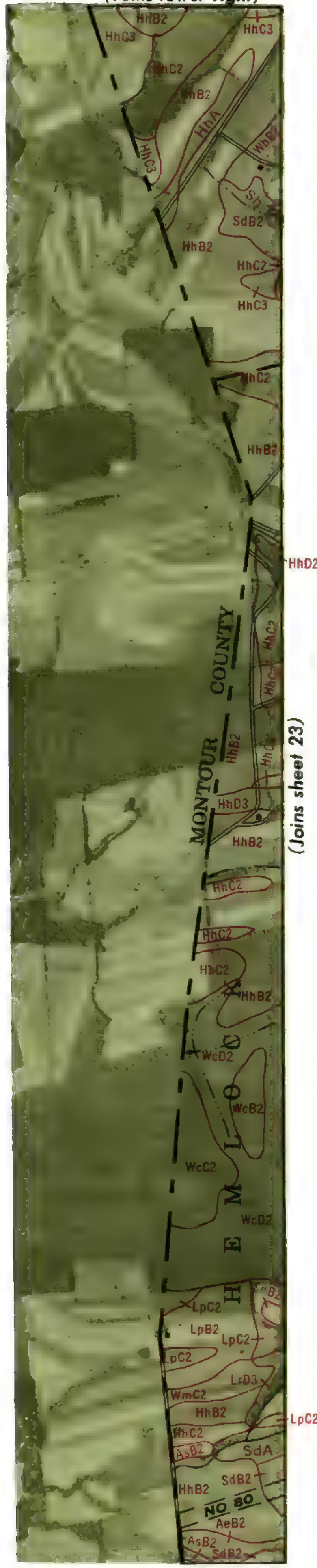
0 ½ 1 Mile Scale 1:20 000 0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Pennsylvania State University College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Conservation Commission.

COLUMBIA COUNTY, PENNSYLVANIA — SHEET NUMBER 18

N

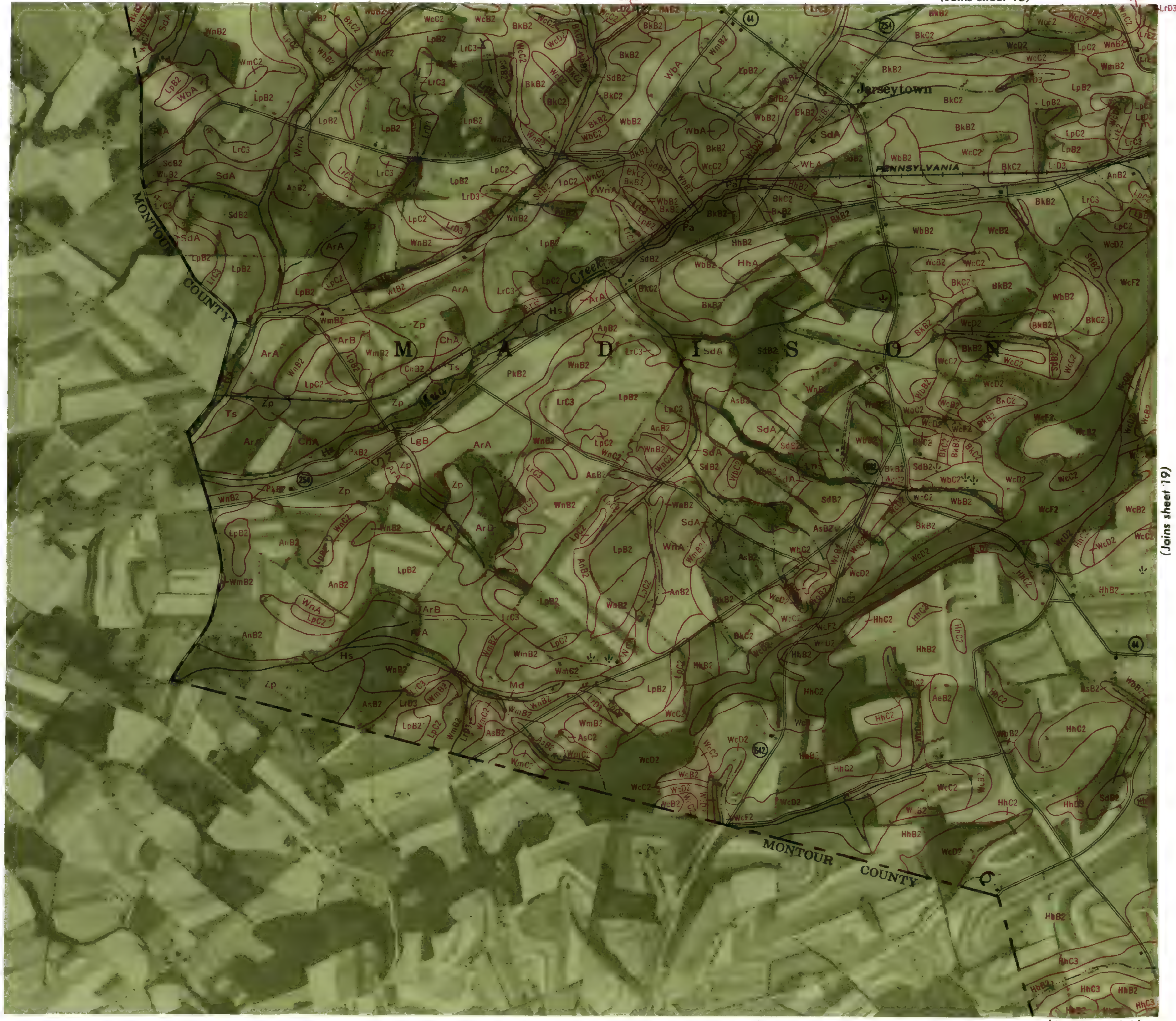
(Joins lower right)



(Sheet 27)

(Joins sheet 23)

(Joins sheet 13)



(Joins sheet 19)

(Joins upper left)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Pennsylvania State University College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Conservation Commission.

(Joins sheet 15)

(Joins sheet 24)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

21

(Joins sheet 16)

(Joins sheet 20)

(Joins sheet 22)

(Joins sheet 25)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Pennsylvania State University College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture, State Conservation Commission.

22

(Joins sheet 17)

(Joins sheet 21)

(Joins sheet 26)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Pennsylvania State University College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Conservation Commission.

24

(Joins sheet 20)

N

(Joins sheet 23)

(Joins sheet 25)

(Joins sheet 28)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

25

(Joins sheet 21)

(Joins sheet 24)

(Joins sheet 26)

(Joins sheet 29)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Pennsylvania State University College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Conservation Commission.

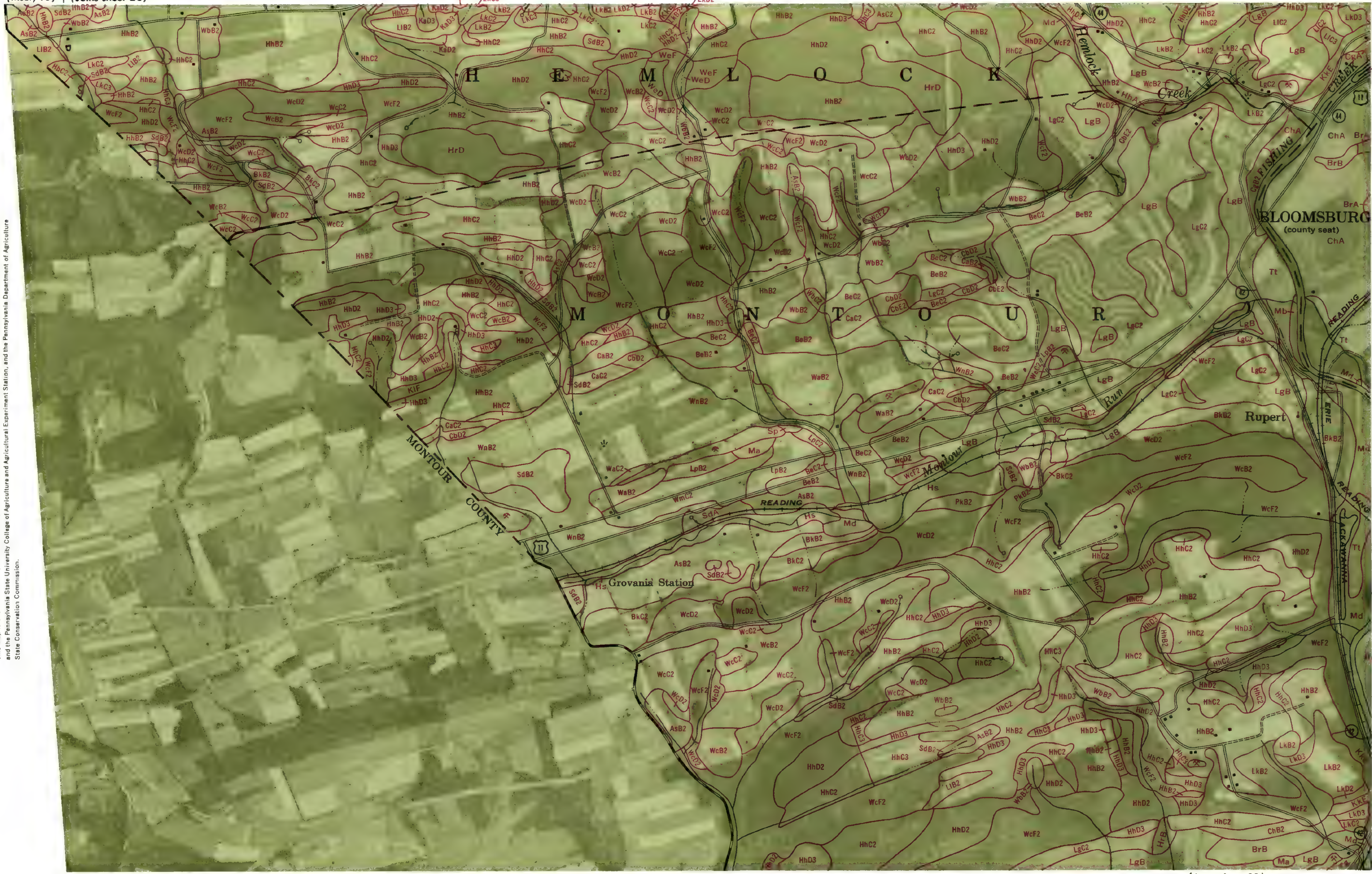
26

(Joins sheet 22)

(Joins sheet 30)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

(Inset, 18) | (Joins sheet 23)



(Joins sheet 28)

(Joins sheet 31)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Pennsylvania State University College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Conservation Commission.

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

29

(Joins sheet 25)

(Joins sheet 28)

(Joins sheet 30)

(Joins sheet 33)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Pennsylvania State University College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Conservation Commission.


30
(Joins sheet 26)
N
(Joins sheet 29)
(Joins sheet 34)
MIFFLIN
NESCOPECK MOUNTAIN
Scotch Valley
Scotch Run
Scotch Valley
McCAULEY MOUNTAIN
BEAVER
Beaver Valley
Beaver Run
BUCK MOUNTAIN
LUZERNE COUNTY
0
½
1 Mile
Scale 1:20000
0
5000 Feet

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Pennsylvania State University College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Conservation Commission.

(32)

(Joins sheet 28)

(Joins sheet 31)

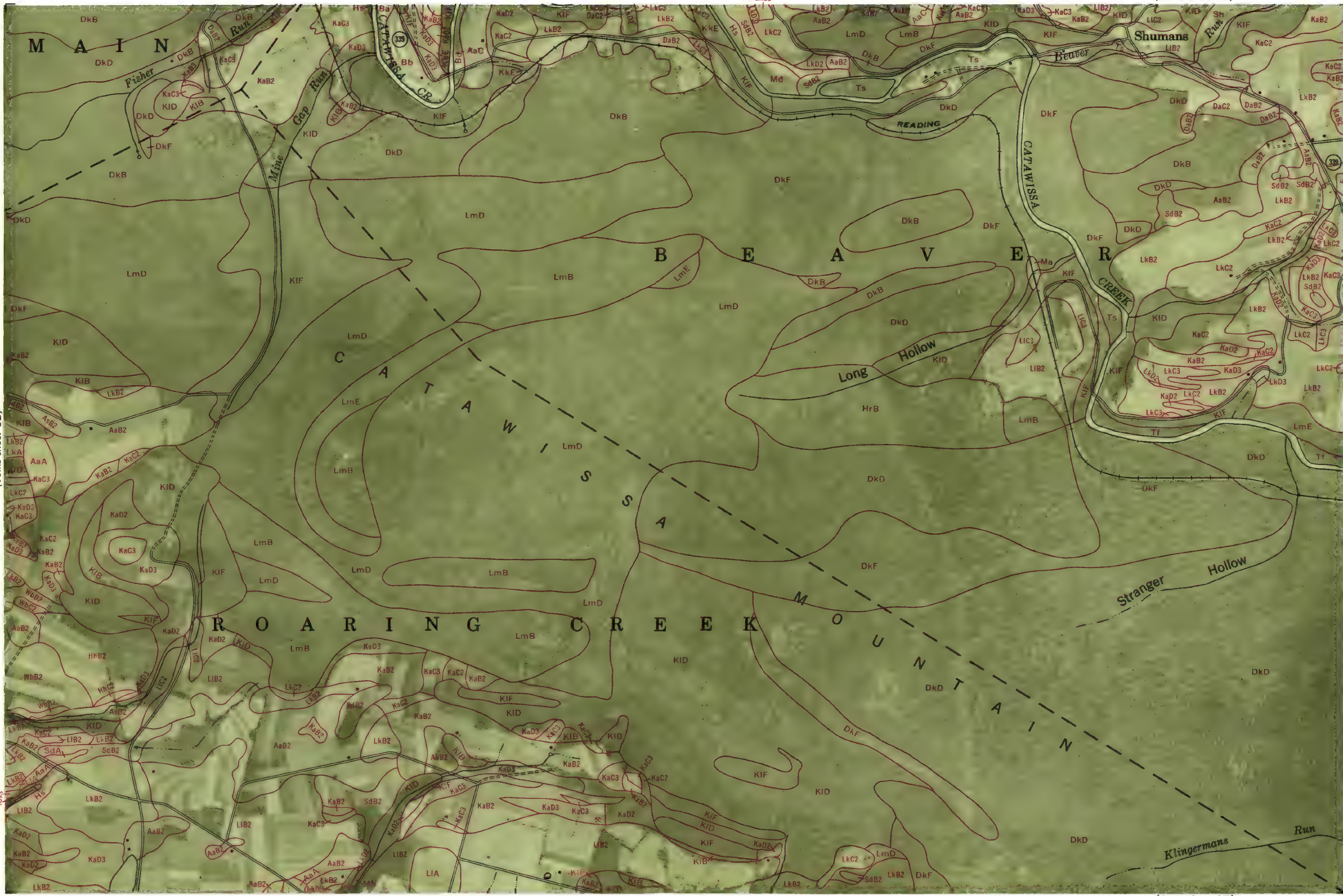
(Joins sheet 33)

(Joins sheet 36)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

(Joins sheet 29)

33



(Joins sheet 32)

(Joins sheet 34)

(Joins sheet 37)

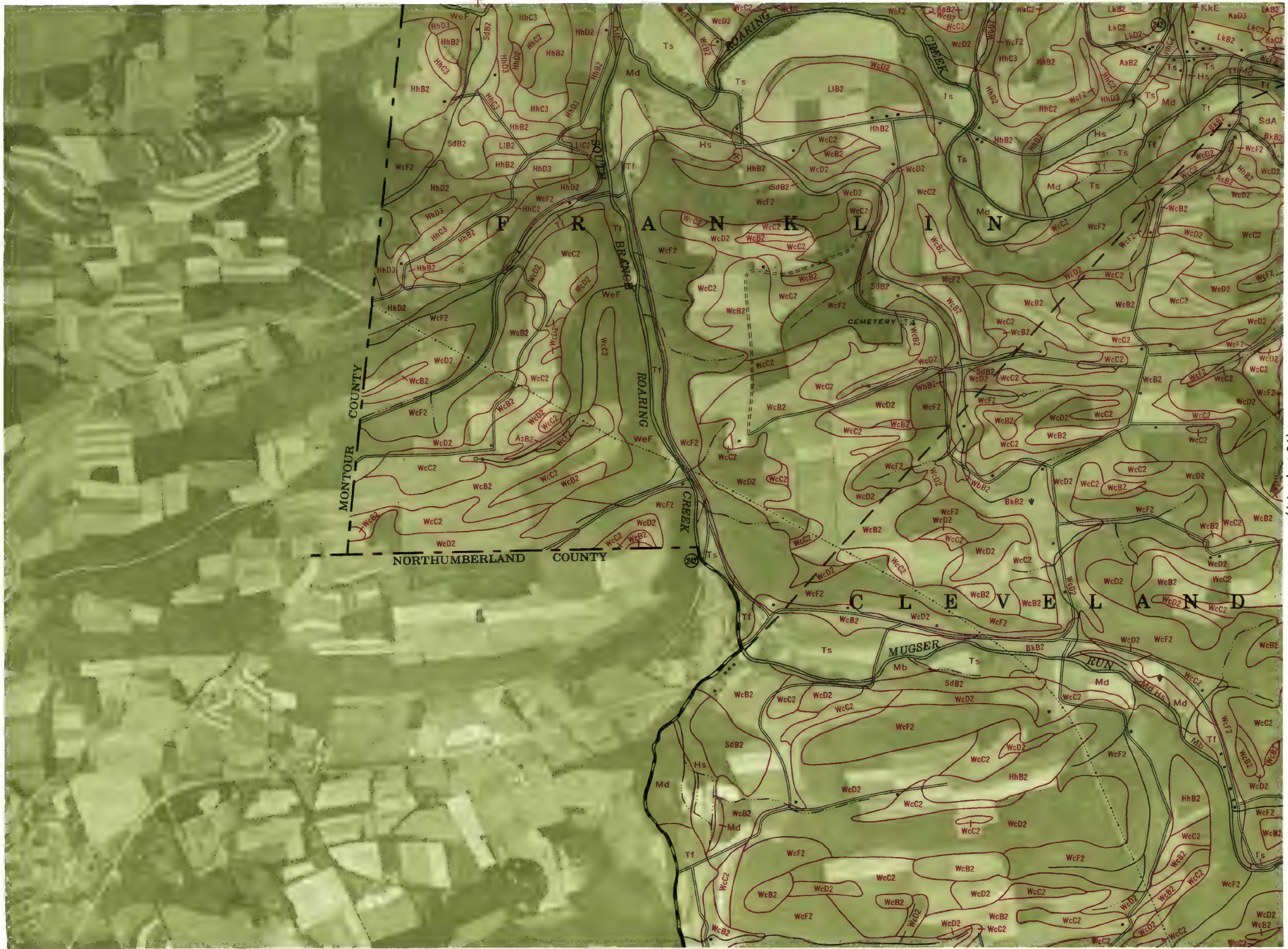
0 ½ 1 Mile Scale 1:20000 0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Pennsylvania State University College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Conservation Commission.


34
(Joins sheet 30)
(Joins sheet 33)
(Joins sheet 38)
N
BUCK MOUNTAIN
BEAVER
LUZERNE COUNTY
SCHUYLKILL COUNTY
Buck Glen
Bunker Hill
CATAWISSA
READING
Beaver Run
Klingermans Run
Cranberry Run
Catawissa Creek
0
½
1 Mile
Scale 1:20000
0
5000 Feet

(Joins sheet 31)

35



(Joins sheet 36)

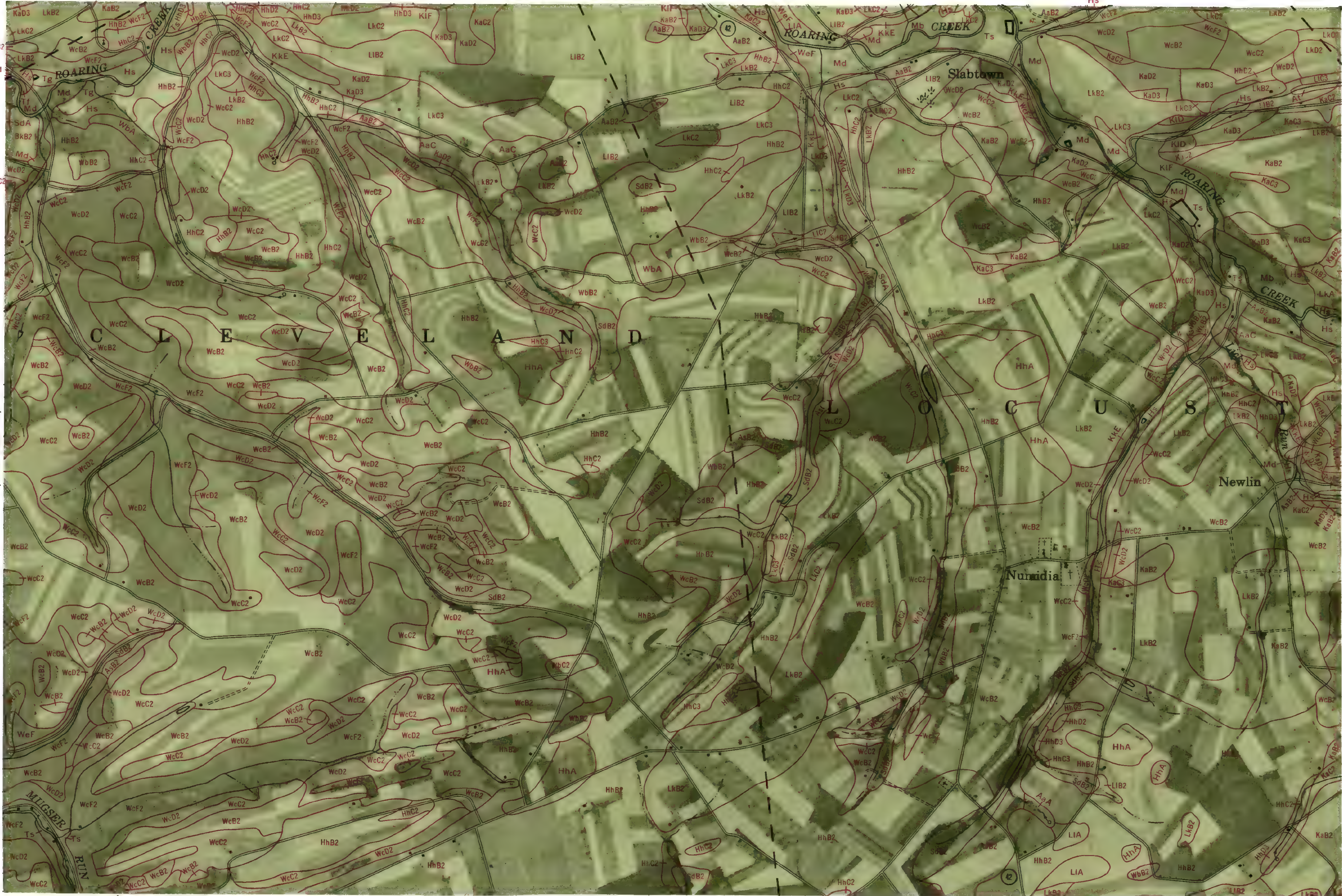
(Joins sheet 39)

0 ½ 1 Mile Scale 1:20000 0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Pennsylvania State University College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Conservation Commission.

(Joins sheet 32)

(Joins sheet 35)



(Joins sheet 37)

(Joins sheet 40)

0 ½ 1 Mile

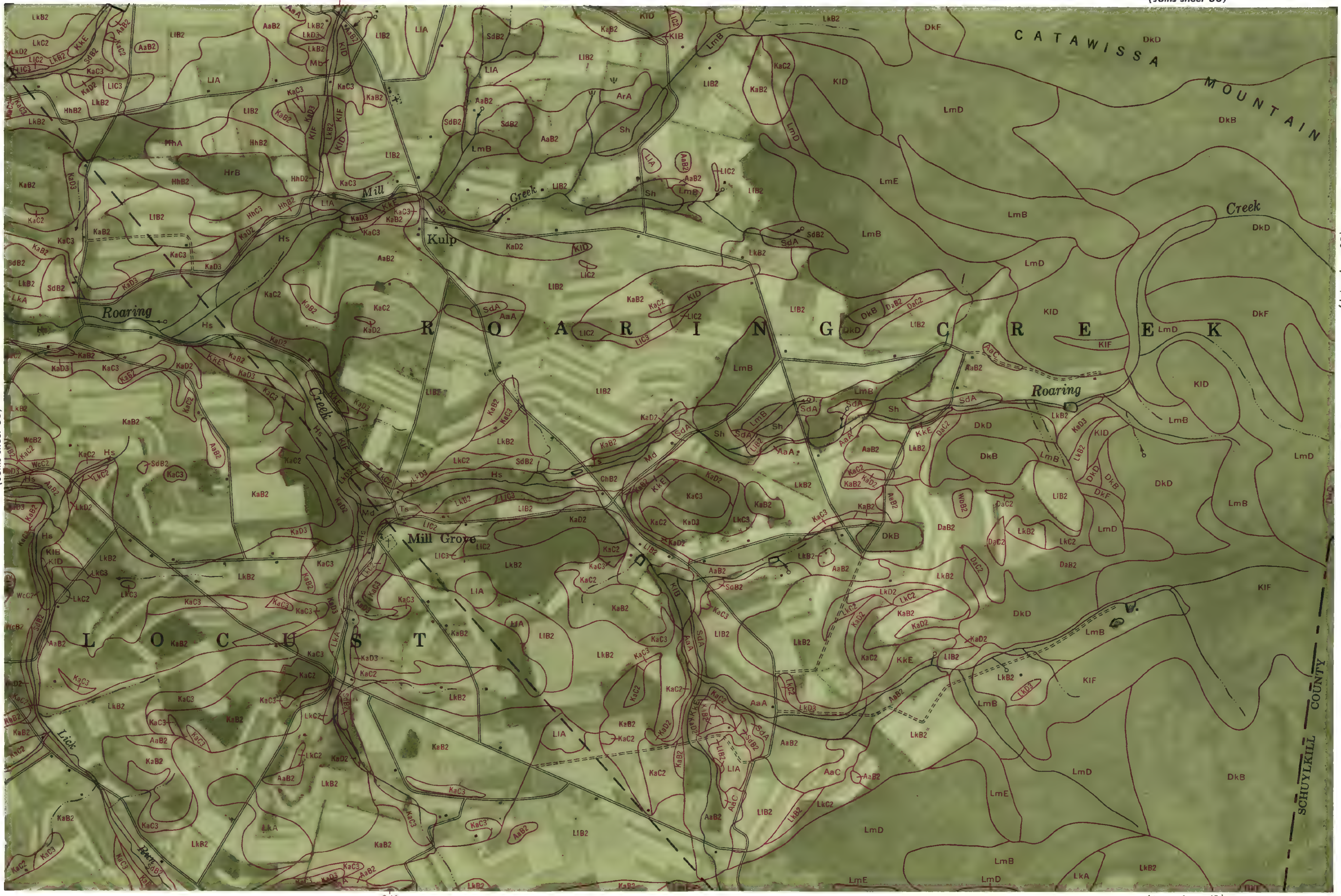
Scale 1:20000

0 5000 Feet

37

(Joins sheet 33)

(Joins sheet 35)



(Joins sheet 38)

(Joins sheet 41)

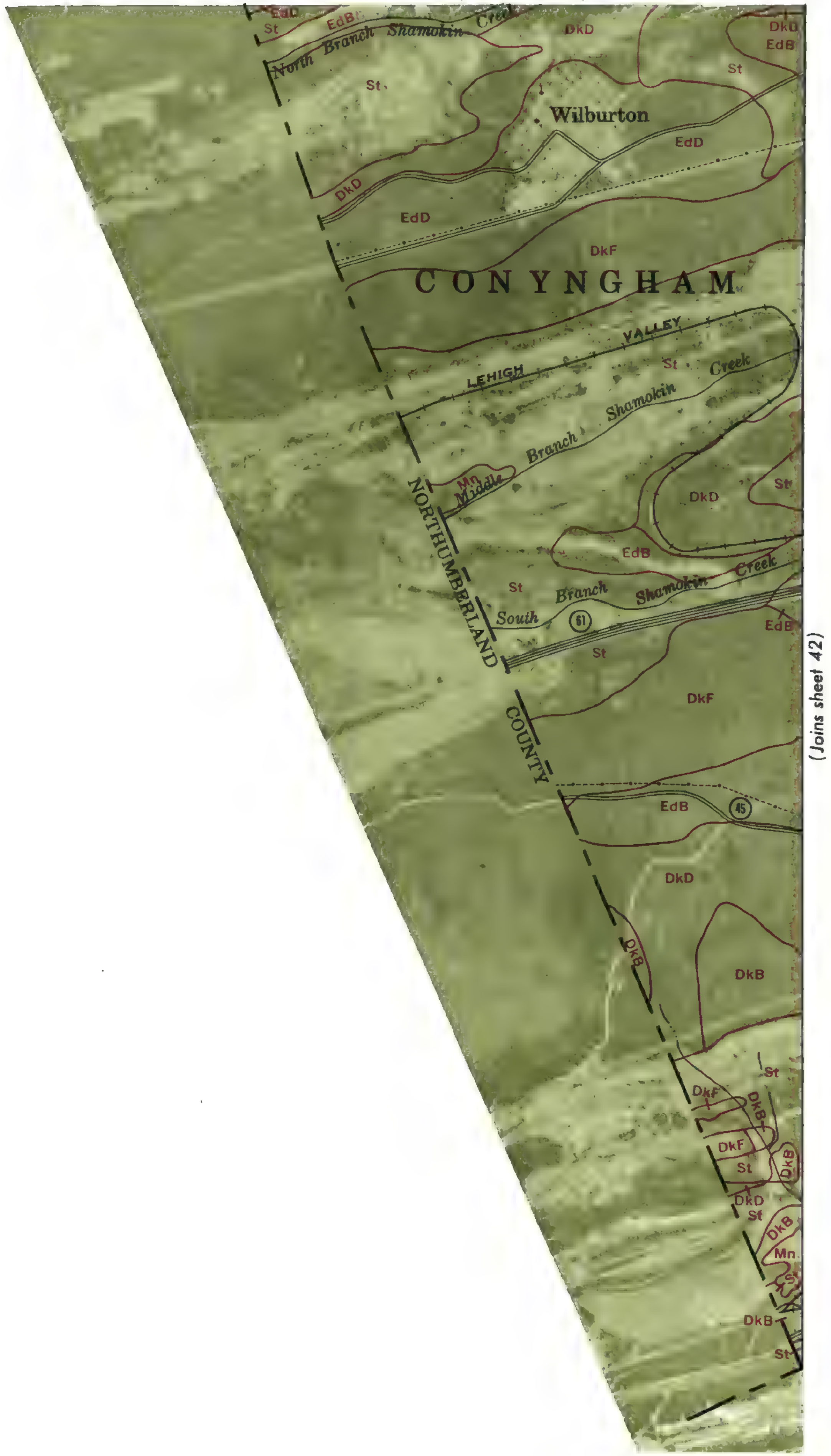
0 ½ 1 Mile Scale 1:20000 0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Pennsylvania State University College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Conservation Commission.

(38)

(Joins sheet 34)

(Joins sheet 40)



(Joins sheet 42)

(Joins sheet 35)

(Joins sheet 40)

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Pennsylvania State University College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Conservation Commission.

0 ½ 1 Mile

Scale 1:20000

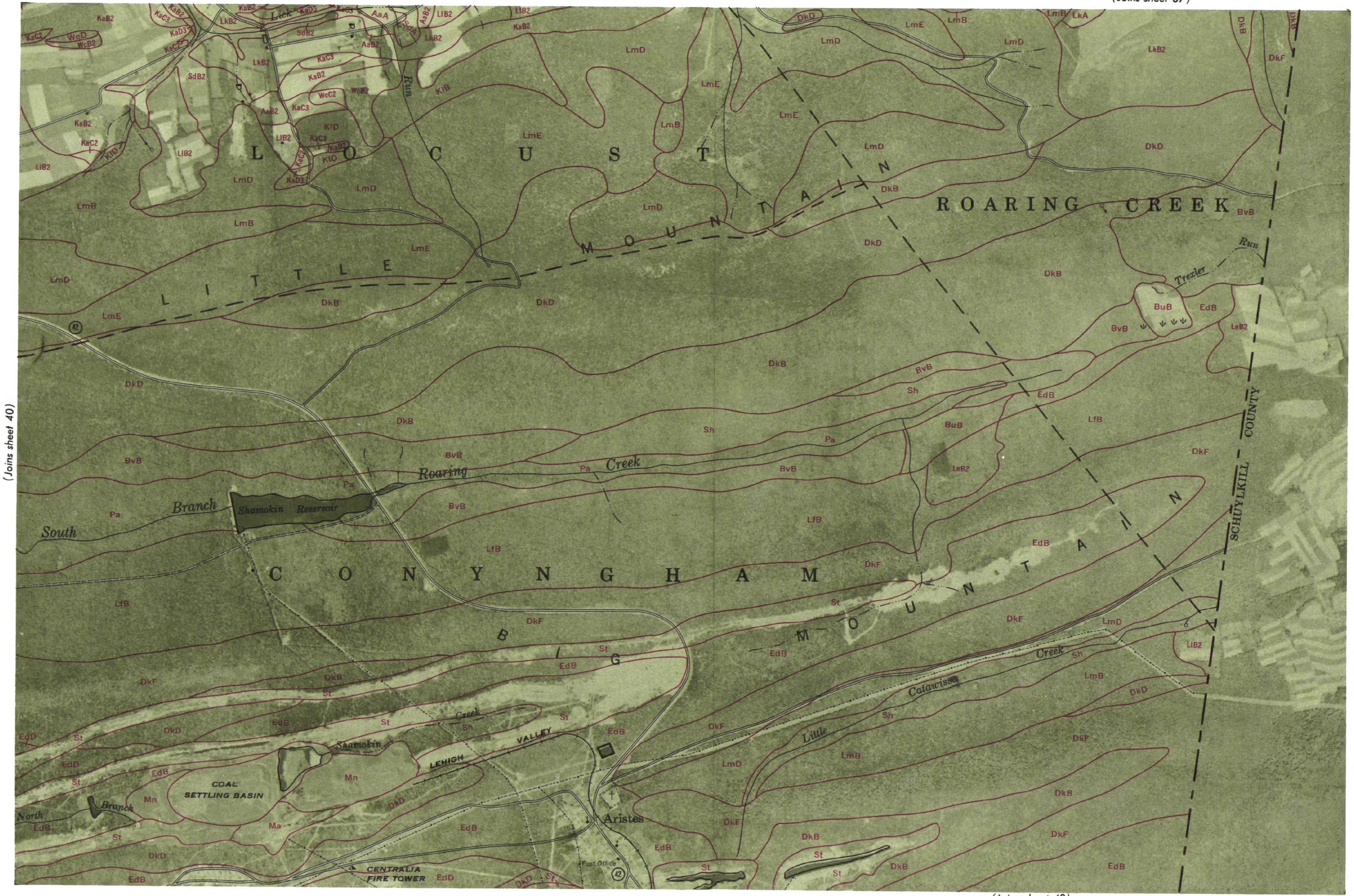
0 5000 Feet


40
(Joins sheet 36)
(Joins sheet 39)
(Joins sheet 41)
(Joins inset, sheet 39)
N
Mugser
Run
Fiserdale
C L E V E L A N D
L O C U S T
L I T T L E
M O U N T A I N
C O N Y N G H A M
South Branch Roaring Creek
S Br Roaring Creek
Shamokin Reservoir
NORTHUMBERLAND COUNTY
North Branch Shamokin Creek
0
½
1 Mile
Scale 1:20000
0
5000 Feet

41

(Joins sheet 37)

(Joins sheet 40)



(Joins sheet 42)

0 ½ 1 Mile

Scale 1:20000

0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Pennsylvania State University College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Conservation Commission.


42
(Joins sheet 41)
(Joins inset, sheet 39)
N
Aristes
Centralia
Post Office
Byrnsville
Germantown
Locust Dale
C O N Y N G H A M
SCHUYLKILL COUNTY
LEHIGH
VALLEY
READING
Middle Branch Shamokin Creek
Mine Run
Big Run
DkD
DkF
DkB
EdB
EdD
St
Mn
0
½
1 Mile
Scale 1:20000
0
5000 Feet

COLUMBIA COUNTY, PENNSYLVANIA
CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Highways and roads
- Dual
- Good motor
- Poor motor
- Trail

Highway markers
- National Interstate
- U. S.
- State

Railroads
- Single track
- Multiple track
- Abandoned

Bridges and crossings
- Road
- Trail, foot
- Railroad
- Ferries
- Ford
- Grade
- R. R. over
- R. R. under
- Tunnel

Buildings
- School
- Church
- Station
- Sawmill

Mines and Quarries

Pits, gravel or other

Power lines

Pipe lines

Cemeteries

Dams

Levees

Tanks

Station, forest fire or lookout

BOUNDARIES

- National or state
- County
- Minor civil division
- Reservation
- Land grant

DRAINAGE

Streams
- Perennial
- Intermittent, unclass.

Canals and ditches — CANAL, DITCH

Lakes and ponds
- Perennial
- Intermittent

Wells — flowing

Springs

Marsh

Wet spot

Alluvial fan

Drainage end

RELIEF

Escarpments
- Bedrock
- Other

Prominent peaks

Depressions (Large, Small)
- Crossable with tillage implements
- Not crossable with tillage implements
- Contains water most of the time

SOIL SURVEY DATA

- Soil boundary and symbol — Dx
- Gravel
- Stones
- Rock outcrops
- Chert fragments
- Clay spot
- Sand spot
- Gumbo or scabby spot
- Made land
- Severely eroded spot
- Blowout, wind erosion
- Gullies